1965

CORVAIR

CHASSIS SHOP MANUAL

ST-59

1965
CHEVROLET
CORVAIR

CHASSIS
SHOP MANUAL

•

FOREWORD

This manual is designed to provide complete information on the maintenance and repair of various units, except the Body, of the 1965 Chevrolet Corvair Passenger Vehicles. Service information for 1965 body items for these vehicles is contained in the 1965 Body Service Manual. For service information on the 1965 Corvair Greenbrier refer to the 1961 Corvair Shop Manual and the 1964 Corvair Shop Manual Supplement.

An effort has been made to produce a manual that will serve as a ready reference book for the experienced service man and also cover step by step procedure for the guidance of the less experienced man.

The Section Index on this page enables the user to quickly locate any desired section. At the beginning of each section, a Table of Contents gives the page number on which major subjects begin. An Index is placed at the beginning of each major subject within the section.

Summaries of Special Tools, when required, are found at the end of major sections, while Specifications covering vehicle components are presented at the rear of the manual.

This manual should be kept in a handy place for ready reference. If properly used, it will enable the technician to better serve the owners of Chevrolet Corvair vehicles.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

• • •

CHEVROLET MOTOR DIVISION
General Motors Corporation
DETROIT, MICHIGAN

SECTION INDEX

Printed in U.S.A.

SECTION 0

GENERAL INFORMATION AND LUBRICATION

CONTENTS OF THIS SECTION

INDEX

MODEL IDENTIFICATION

Series	Model Number	Description
Standard	10139	4-Door Sport Sedan, 6-Passenger
	10137	2-Door Sport Coupe, 4-Passenger
Monza	10539	4-Door Sport Sedan, 6-Passenger
	10537	2-Door Sport Coupe, 4-Passenger
	10567	2-Door Convertible, 4-Passenger
Corsa	10737	2-Door Sport Coupe, 4-Passenger
	10767	2-Door Convertible, 4-Passenger

VEHICLE DIMENSIONS—CORVAIR

Model	4-Door Sport Sedan	2-Door Sport Coupe	2-Door Convertible
Length Overall	183.3"	183.3"	183.3"
Width Overall (Body)	69.7"	69.7"	69.7"
Height Overall	51.2"	51.3"	51.5"
Wheelbase	108"	108"	108"
Tread-Front	55.0"	55.0"	55.0"
Tread-Rear	57.2"	57.2"	57.2"
Curb Weight	Approximately 2555 lbs--4-Dr. Sedan		

UNIT AND SERIAL NUMBER LOCATIONS

The following illustrations show the locations of the unit or serial numbers of various components. These designations may be necessary to the servicemen in the preparation of L. & M.R.'s and Product Information Reports.

The prefixes on certain units identify the plant in which the unit was manufactured, and thereby permits proper follow-up of the plant involved to get corrections made when necessary.

Always include the prefix and-or suffix in the number.

ENGINE NUMBER

The engine number (location shown, fig. 4) contains manufacturing plant, month and day of manufacture, and transmission type. A typical engine number would be T0430-Z, which would breakdown thus:

T--Manufacturing Plant (Tonawanda)
04--Month of Manufacture (April)
30--Day of Manufacture (Thirtieth)
Z--Transmission Type (Z-Powerglide, Y-Manual)-suffix

VEHICLE SERIAL NUMBER

A typical vehicle serial number tag (See Figure 1) yields manufacturers identity, vehicle type, model year, assembly plant and production unit number when broken down as shown in the following chart. See Figure 1 for tag location on vehicle.

1	2	3	4	5
Manufacturers Identity	Body Style	Model Year	Assembly Plant	Unit Number
1	0139	5	W	100025

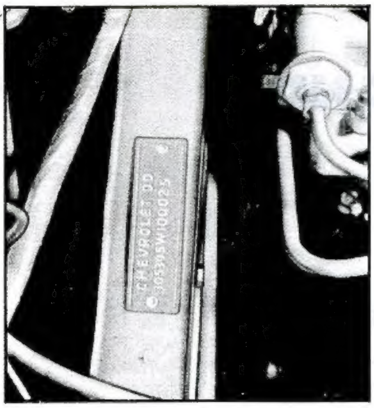


Fig. 1—Vehicle Serial Number Tag Located on L.H. Rear Top of Side Rail Rearward of Battery Retaining Bolt

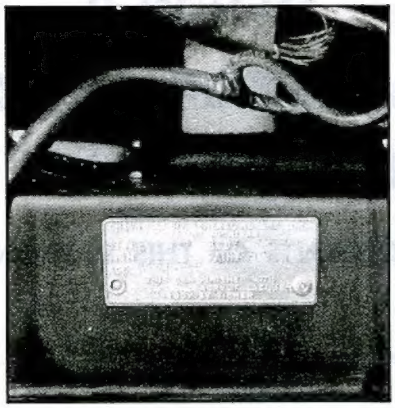


Fig. 2—Body Identification Tag Located on Top of Rear Rail to Left of Engine Mount

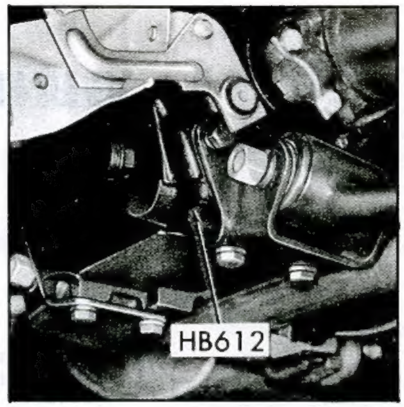


Fig. 3—Differential Number Stamped Lower Left Side of Casting

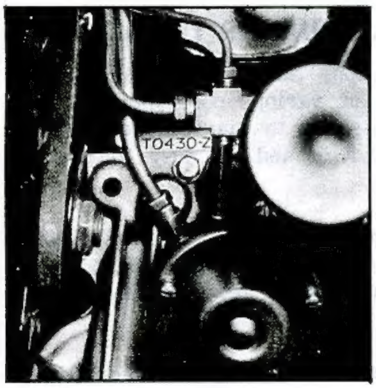


Fig. 4—Engine Number Stamped on Top of Engine Block, Behind Oil Pressure Sending Unit

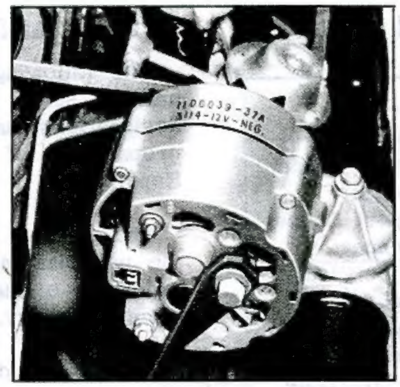


Fig. 5—Delcotron Information Located on Drive End Frame

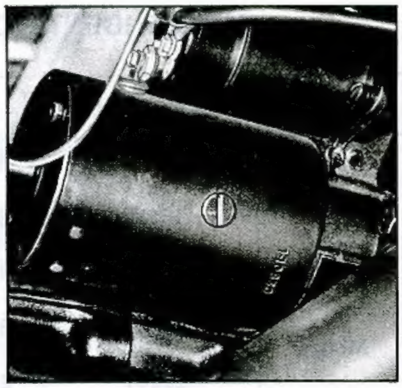


Fig. 6—Starter Serial Number and Production Date Stamped into Outer Case, Toward Rear

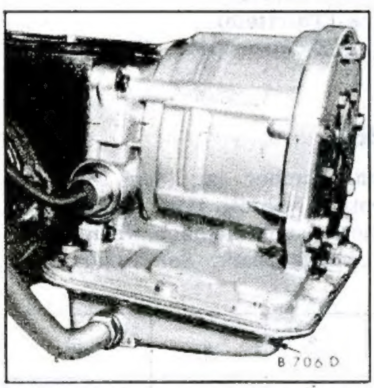


Fig. 7—Powerglide Transmission Unit Number Stamped on Bottom of Oil Pan

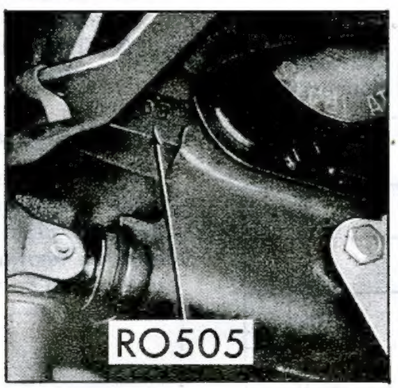


Fig. 8-3—and 4-Speed Transmission Unit Numbers Stamped on a Boss on L.H. Side of Transmission Above Shifter Shaft Outlet

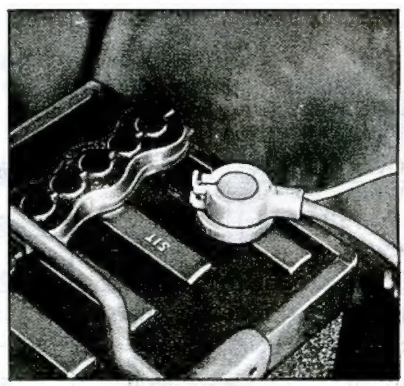


Fig. 9—Battery Number Stamped on Top of the First Cell Adjacent to Positive Terminal

1. Manufacturer's identity number assigned to all Chevrolet built vehicles.
2. See Model Identification in this section.
3. Last number of model year (1965).
4. W--Willow Run.
5. Unit numbering will start at 100,001 at all plants.

SELECTION OF GASOLINE

The Corvair Turbo-Air six cylinder engine is designed to deliver peak performance on what is designated as regular grade gasoline in the United States and Canada.

The Corsa model and all Corvair models equipped with the Turbo-Air (110 H.P.) engine are designed to operate most efficiently on Premium gasoline.

Regular gasoline may vary in octane between manufacturers or between different sections of the country. If unfavorable performance is encountered because of either or both of these factors, dealer adjustment of ignition timing will restore the vehicle to normal operation.

KEYS AND LOCKS

Two keys are provided with each Corvair.

The octagonal-end key operates the ignition switch and front door locks. The round-end key operates the locks for the glove box and front compartment lid.

Lock cylinders are furnished for service uncoded; this necessitates the coding of all replacement lock cylinders.

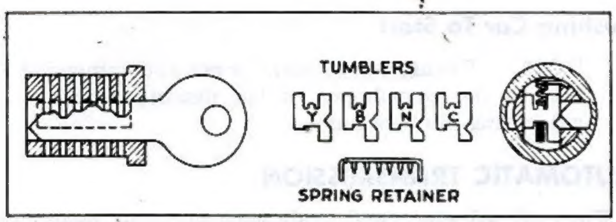


Fig. 10—Side Bar Lock

The side bar type lock (fig. 10) is used for the ignition, door and front compartment on passenger cars. Glove compartment locks are wafer tumbler, single bitted type having 4 tumblers on passenger cars. To protect owners, automobile lock manufacturers stamp the lock number on the lock core, shaft, etc., where they will not show until the lock is removed.

To obtain the code number, remove the door lock. The key number may be obtained from the lock core, shaft, etc., which will be the same on all of the other locks.

In addition, when a lock cylinder requires replacement the lock code number may be obtained either from the key, if available, or from the old lock cylinder which is being replaced.

Once the code number of the lock is obtained, look up this number in a key cutting book. There are two types of code booklets in general use, one which lists the cutting code by letters C, N, B and Y. Numbers or letters are always recorded from the head of the key to the end.

Numbers may be transposed to letters to numbers as follows:

Code Book—Numbers	Code Book—Letters
1	C
2	N
3	B
4	Y

All side bar locks furnished to the field by the Parts Department are uncoded; that is, they are furnished without tumblers, springs or spring retainers. These parts are serviced separately. The tumblers come in four different depths indicated by colors "C" for copper, "N" for nickel, "B" for black and "Y" for yellow.

The side bar locks have six tumbler positions, and in looking up the cutting code, the following may be used as an example. After key code number is determined, either from key or from number stamped on lock cylinder, refer to your code book and record the key cutting information as follows:

Key of lock code Number	Key cutting code Numerical	Key cutting code Alphabetical
8109	2-3-2-1-2-4	N-B-N-C-N-Y
Cutting or Tumbler position from head of lock.	1-2-3-4-5-6	1-2-3-4-5-6

The numbers or letters (depending on code book) which are written above the cutting or tumbler position indicate the different color tumblers which are to be dropped into each tumbler slot of the lock: "C"—copper, "N"—nickel, "B"—black, "Y"—yellow.

NOTE: If code book used lists the key cutting code numerically, the numbers must be transposed to letters as previously stated in order to select proper color tumblers for installation into the lock.

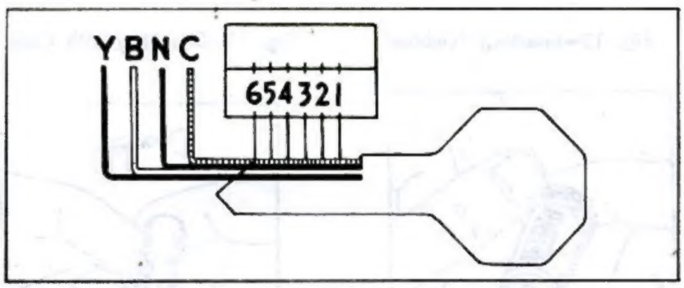


Fig. 11—Tumbler Requirement Diagram

In cases where a code book is not available, the diagram as shown in Figure 11 may be used to determine the tumblers required to assemble an uncoded lock cylinder.

1. Lay the key on the diagram (fig. 11) with the bottom of the key flush with the edge of the drawing, head and point carefully lined up.
2. Read the code in letters C-N-B-Y from the head of key to the end from positions 1 to 6 inclusive. As

each depth is determined write that letter in the blank space provided above the position numbers (1-2-3-4-5-6).

3. With the key properly lined up on the diagram, all cuts that show in the first section are to be marked "C".
4. Cuts that fall in the first black section, mark "N."
5. Cuts that fall in the White section, mark "B."
6. Cuts that fall in the second black section, mark "Y."

After the letters (C-N-B-Y) have been determined and written above the cutting positions, the lock cylinder should be assembled as follows:

Lock Cylinder Assembly

1. Hold cylinder with head of cylinder away and, starting at the head of the cylinder, insert the tumblers in their proper slots in the order called for by the code; ribbed side toward you and long point down (fig. 12).
2. After all tumblers are in place, check for correctness with the code. Then press tumblers down with one finger (fig. 13).
3. Insert one tumbler spring in the space provided above each tumbler (fig. 14).

CAUTION: If the springs are tangled, do not pull them apart—unscrew them.

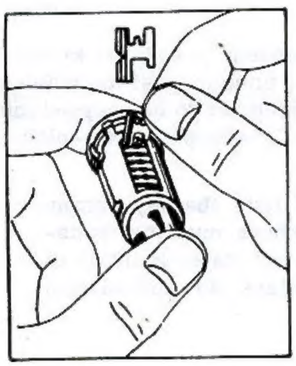


Fig. 12—Inserting Tumblers

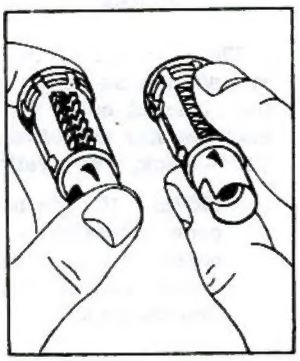


Fig. 13—Checking with Code

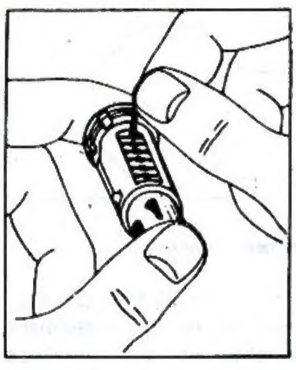


Fig. 14—Inserting Tumbler Springs

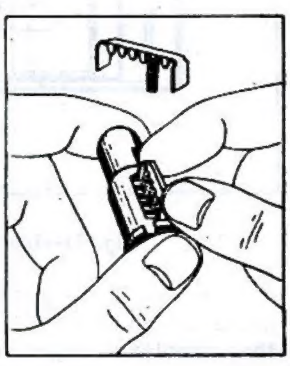


Fig. 15—Inserting Spring Retainer

4. Reverse the lock cylinders so that the head of the cylinder is now toward you. Insert the spring retainer so that one of its six prongs enters into each of the springs and the two large end prongs slide into the slots at either end of the cylinder (fig. 15). Press the retainer down with one finger.
5. To check, insert proper key and if tumblers are installed properly the side bar will be allowed to drop down. If bar does not drop down, remove the key, spring retainer, springs and tumblers and reassemble correctly.

NOTE: If the tumblers have not been assembled correctly and not according to the code, the tumblers can be removed from the cylinder by holding it with the tumbler slots down, pulling the side bar out with the fingers and jarring the cylinder to shake the tumblers out. This procedure is necessary because after the tumblers have been pressed down into the cylinder they are held in their slots by the cross bar.

6. If after checking it is found that the lock is assembled properly, remove key and place cylinder in a vise using leather or wood on each side to prevent damage to the cylinder.
7. Stake the retainer securely in place by staking the cylinder metal over both edges of the retainer ends, using a suitable staking tool at right angles to the top of the retainer and from the cast metal of the cylinder over the retainer at each corner.

PUSHING, TOWING AND LIFTING

Pushing Car To Start

NOTE: Towing car to start is not recommended due to the possibility of the disabled car accelerating into tow car.

AUTOMATIC TRANSMISSION

Turn off all electrical loads such as radio, heater and, if possible, lights until the engine starts.

With the ignition key turned ON and the transmission in N (neutral), allow the car speed to reach 25 to 30 miles per hour. Then shift the transmission to L (low) position. After the engine starts, the transmission may be operated in the normal manner. Never tow the car to start.

MANUAL TRANSMISSION

When a push start is necessary turn off all electrical loads such as heater, radio and, if possible, lights, turn on the key, depress the clutch, and place the shift lever in high gear. Release the clutch when your speed reaches 10 to 15 miles per hour.

Emergency Towing

If a vehicle equipped with Powerglide becomes disabled and requires towing or pushing, speed must not exceed 50 MPH.

Both manual and Powerglide transmissions should be towed in neutral only, with parking brakes fully released.

When towing a vehicle on its front wheels only, the steering wheel should be secured to maintain a straight forward position.

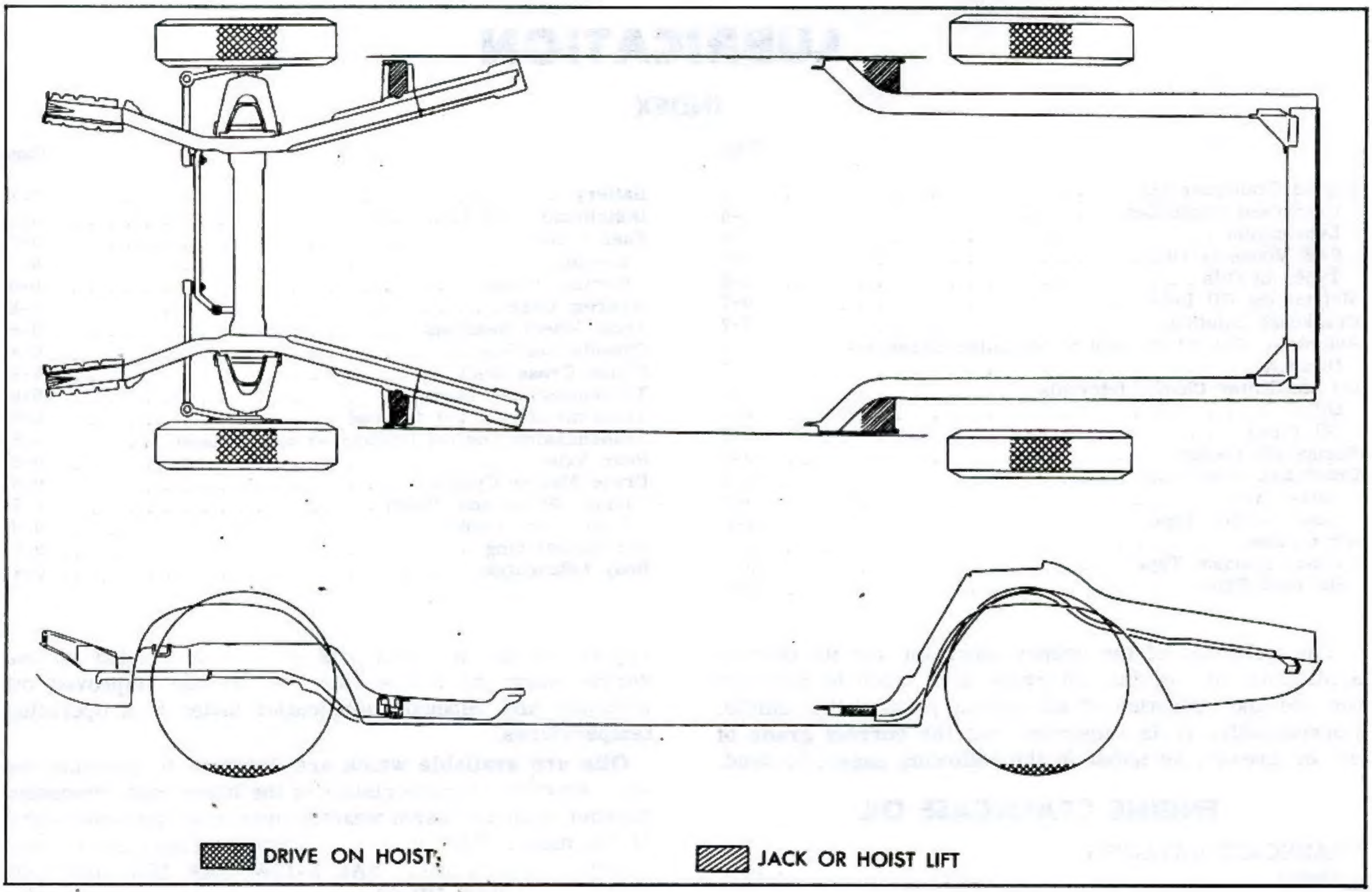


Fig. 16—Lifting Point Diagram

Lifting Car With Drive-on Hoist

Many dealer service facilities and service stations are now equipped with a type of automotive hoist which must bear upon some part of the frame in order to lift the vehicle. In Figure 16 the shaded areas indicate areas recommended for hoist contact.

Lifting with the Auto Jack

Lifting areas on Corvair models are shown in Figure 16. When locating the auto jack, be sure the tab on the jack catches the outer body flange, thus preventing it from sliding too far under the vehicle.

LUBRICATION

INDEX

The selection of the proper lubricant and its correct application at regular intervals does much to increase the life and operation of all moving parts of the vehicle. Consequently, it is important that the correct grade of oil or grease, as noted in the following pages, be used.

ENGINE CRANKCASE OIL

CRANKCASE CAPACITY

Refill	4 Qts.
When changing oil filter add	.5 Qts.

Lubrication

Crankcase oil should be selected to give the best performance under the climatic and driving conditions in the territory in which the vehicle is driven.

During warm or hot weather, an oil which will provide adequate lubrication under high operating temperatures is required.

During the colder months of the year, an oil which will permit easy starting at the lowest atmospheric temperature likely to be encountered, should be used.

When the crankcase is drained and refilled, the crankcase oil should be selected, not on the basis of the existing temperature at the time of the change, but on the lowest temperature anticipated for the period during which the oil is to be used.

Unless the crankcase oil is selected on the basis of viscosity or fluidity at the anticipated temperature, difficulty in starting will be experienced at each sudden drop in temperature.

SAE Viscosity Oils

SAE Viscosity Numbers indicate only the viscosity or body of the oil, that is, whether an oil is a light or a heavy body oil, and do not consider or include other properties or quality factors.

The lower SAE Viscosity Numbers, such as SAE 5W and SAE 10W which represent the light body oils, are recommended for use during cold weather to provide easy starting and instant lubrication. The higher SAE Viscosity Numbers such as SAE 20 and SAE 20W, which represents heavier body oils, are recommended for use during warm or hot weather to provide improved oil economy and adequate lubrication under high operating temperatures.

Oils are available which are designed to combine the easy starting characteristics of the lower SAE Viscosity Number with the warm weather operating characteristics of the higher SAE Viscosity Number. These are termed "multi-viscosity oils," SAE 5-10W, SAE 10W-20W, SAE 10W-30, and SAE 5W-30.

The following chart will serve as a guide for the selection of the correct SAE Viscosity Number for use under different atmospheric temperature ranges, and suggests the appropriate SAE Viscosity Numbers when multi-viscosity oils are used.

Lowest Anticipated Temperature During Time Oil Will Be in Crankcase	Recommended SAE Viscosity Oils	Recommended SAE Multi-Viscosity Oils
32°F.	SAE 30	SAE 10W-30
−10°F.	SAE 10W	SAE 10W-30
Below—10°F.	SAE 5W	SAE 5W-20

Types of Oils

In service, crankcase oils may form sludge and varnish and under some conditions, corrosive acids unless protected against oxidation.

To minimize the formation of these harmful products and to assure the use of oil best suited for present day operating conditions, automobile manufacturers have developed a series of sequence tests designed to evaluate the ability of any oil to properly lubricate automobile engines.

It is recommended that only those oils which are certified by their suppliers as meeting or exceeding the maximum severity requirements of these sequence tests (or GM Standard 4745-M) to be used in Corvair engines. Certified sequence tested oils will be described as such on their containers.

Maintaining Oil Level

The oil gauge rod is marked "Full" and "Add Oil." These notations have broad arrows pointing to the level lines. The oil level should be maintained between the two lines, neither going above the "Full" line nor under the "Add Oil" line. DO NOT OVERFILL.

Check the oil level frequently and add oil when necessary.

> **NOTE:** It is advisable, when taking a long trip, to recheck the oil level after the first 100 miles of the trip. This is a precautionary measure, due to the possibility of crankcase dilution which would give a false oil level reading. The diluents which are usually the result of incomplete engine warm-up (traveling short distances) are driven out of the crankcase with high speed driving temperatures.

Crankcase Dilution

Probably the most serious phase of engine oil deterioration is that of crankcase dilution which is the thinning of the oil by fuel vapor leaking by pistons and rings and mixing with the oil and by condensation of water on the cylinder walls and crankcase.

Leakage of fuel, or fuel vapors, into the oil pan occurs mostly during the "warming up" period when the fuel is not thoroughly vaporized and burned. Water vapor enters the crankcase through normal engine ventilation and through exhaust gas blow-by. When the engine is not completely warmed up, these vapors condense, combine with the condensed fuel and exhaust gases and form acid compounds in the crankcase.

As long as the gases and internal walls of the crankcase are hot enough to keep water vapor from condensing, no harm will result. However, when the engine is run in low temperatures moisture will collect and unite with the gases formed by combustion resulting in an acid formation. The acid thus formed is likely to cause serious etch or pitting which will manifest itself in excessively rapid wear on pistons pins, crankshaft bearings and other moving parts of the engine, oftentimes causing the owner to blame the car manufacturer or the lubricating oil when in reality the trouble may be traced back to the character of fuel used, or a condition of the engine such as excessive blow-by or improper carburetor adjustment.

Automatic Control Device to Minimize Crankcase Dilution

The engine is equipped with automatic devices which aid greatly in minimizing the danger of crankcase dilution.

An automatic choke reduces the danger of raw or unvaporized fuel entering the combustion chamber and leaking into the oil reservoir.

An efficient crankcase ventilating system drives off fuel vapors and aids in the evaporation of the raw fuel and water which may find its way into the oil pan.

OIL AND FILTER CHANGE INTERVALS

OIL

To insure continuation of best performance, low maintenance cost and long engine life, it is necessary to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal driving conditions draining the crankcase and refilling with fresh oil every 6000 miles or every 60 days, whichever occurs first, is recommended. See Note 3.

It is always advisable to drain the crankcase only after the engine has become thoroughly warmed up or reached normal operating temperature. The benefit of draining is, to a large extent, lost if the crankcase is drained when the engine is cold, as some of the suspended foreign material will cling to the sides of the oil pan and will not drain out readily with the cold, slower moving oil.

When checking or adding oil, be careful to avoid spilling or dropping oil onto the engine shrouding.

OIL FILTER

Change the filter element every 6000 miles or every six months, whichever occurs first. See Note 3.

ENGINE OIL COOLER

Every 12,000 miles remove cover and brush or blow out accumulated dirt. See Note 3.

CRANKCASE VENTILATION

Valve Type

At every oil change the valve should be tested for proper function and replaced when necessary.

Fixed Orifice Type

Check at every oil change. If dirty or plugged clear with suitable drill. Twist drill by hand to remove any sludge or carbon formation. See Note 3.

Air Cleaner

> **NOTE:** Under prolonged dusty driving conditions, it is recommended that these operations be performed more often.

Paper Element Type

First 6,000 miles inspect or test element; if satisfactory, re-use element but recheck every 6,000 miles until replaced. Element must not be washed, oiled, tapped, or cleaned with an air hose.

Oil Bath Type

Check every 6,000 miles. Clean if necessary, and refill with engine oil SAE 50, when temperature is above freezing and SAE 20 below freezing.

BATTERY

Every 6,000 miles clean and oil battery terminals and oil felt washer. Clean top of battery with diluted ammonia or soda solution and flush with clean water. Check state of charge especially in freezing weather. An undercharged battery may freeze and break.

DISTRIBUTOR CAM LUBRICATOR

Every 12,000 miles rotate cam lubricator 180 degrees. Replace lubricator at 24,000 mile intervals.

FUEL FILTER

Corvair

Replace filters, located in each carburetor inlet, only if flooding occurs.

Corvair Corsa

The fuel filter is a separate unit mounted on the air cleaner support bracket at the left of the air cleaner. It should be replaced at 12,000 mile intervals. At the same interval, also clean the screen located in the carburetor inlet.

STEERING GEAR

Every 36,000 miles remove the filler plug and check to see that the lubricant is at the level of the filler plug hole. If necessary add chassis grease as required.

FRONT WHEEL BEARINGS

Whenever brakes are serivced, clean and repack bearings with high melting point wheel bearing lubricant. Replace grease seals at the same time.

CHASSIS LUBRICATION

Every 6,000 miles or six months lubricate the chassis, at the points listed below, with lubricant specified in Note 1.

Front Suspension--4 Lubrication Fittings.
Steering Linkage--4 Lubrication Fittings.

CLUTCH CROSS SHAFT

Periodic lubrication is not required. At 36,000 miles or sooner, if necessary, remove plug, install lubrication fitting and lubricate with chassis grease. (Note 1)

TRANSMISSION—POWERGLIDE

Every 6,000 miles check fluid level on dip stick, located in the right front of the engine compartment, with engine idling, selector lever in NEUTRAL position, parking brake set and transmission at operating temperature. Add automatic transmission fluid type "A" bearing the mark AQ-ATF, followed by a number and the suffix letter "A", to full mark on dip stick. DO NOT OVERFILL. Correct oil level must be established by dip stick measurement.

Add small amounts of oil, checking the level after each addition, until the proper level is reached.

NOTE: From the "Add Oil" mark to the "Full" mark on the dip stick indicates a difference of only 1 pint of fluid.

Every 12,000 miles (more frequently, depending on severity of service, if vehicle is used to pull trailer, carry full loads during high ambient temperatures, operate in mountainous terrain or operate under other severe conditions)—Remove fluid from the transmission sump and add two (2) quarts of fresh fluid. Operate transmission through all ranges and check fluid level as described above.

TRANSMISSION—3 AND 4-SPEED

Follow recommendations under "Rear Axle".

TRANSMISSION CONTROL LINKAGE—3 AND 4-SPEED

Every 12,000 miles pull back rubber boot and surround connector and the surrounding area with lubricant specified in Note 1.

Every 12,000 miles remove tunnel cover under vehicle and lubricate gearshift lever ball and socket with lubriplate or equivalent.

REAR AXLE

Whenever engine oil level is checked, also check axle oil level on the dip stick at operating temperature. If oil level is at or below "ADD" mark on dip stick, fill with lubricant specified in Note 2, to level of filler plug hole on axle. Whenever rear axle lubricant is low, also check 3 or 4-speed lubricant level.

BRAKE MASTER CYLINDER

Every 6,000 miles check fluid level and maintain 1/4" below opening. If necessary, add GM Supreme No. 11 Hydraulic Brake Fluid or equivalent.

PARKING BRAKE AND CLUTCH PULLEYS AND CABLES

Every 12,000 miles lubricate pulleys under dash. Remove the tunnel cover under vehicle and lubricate pulleys and cable bearing points with lubricant specified in Note 1. Lubricate gearshift lever ball and socket at the same time.

AIR CONDITIONING

Every 6,000 miles check sight glass, located under the hood, after the system has been in operation for several minutes. Sight glass should be clear. Bubbles or dirt indicate a leak which should be corrected immediately by your Chevrolet Dealer.

Every week-during winter months--run the system 10 to 15 minutes to ensure proper lubrication of the seals and moving parts.

BODY LUBRICATION

For Corvair Body Lubrication see the 1965 "Body Service Manual."

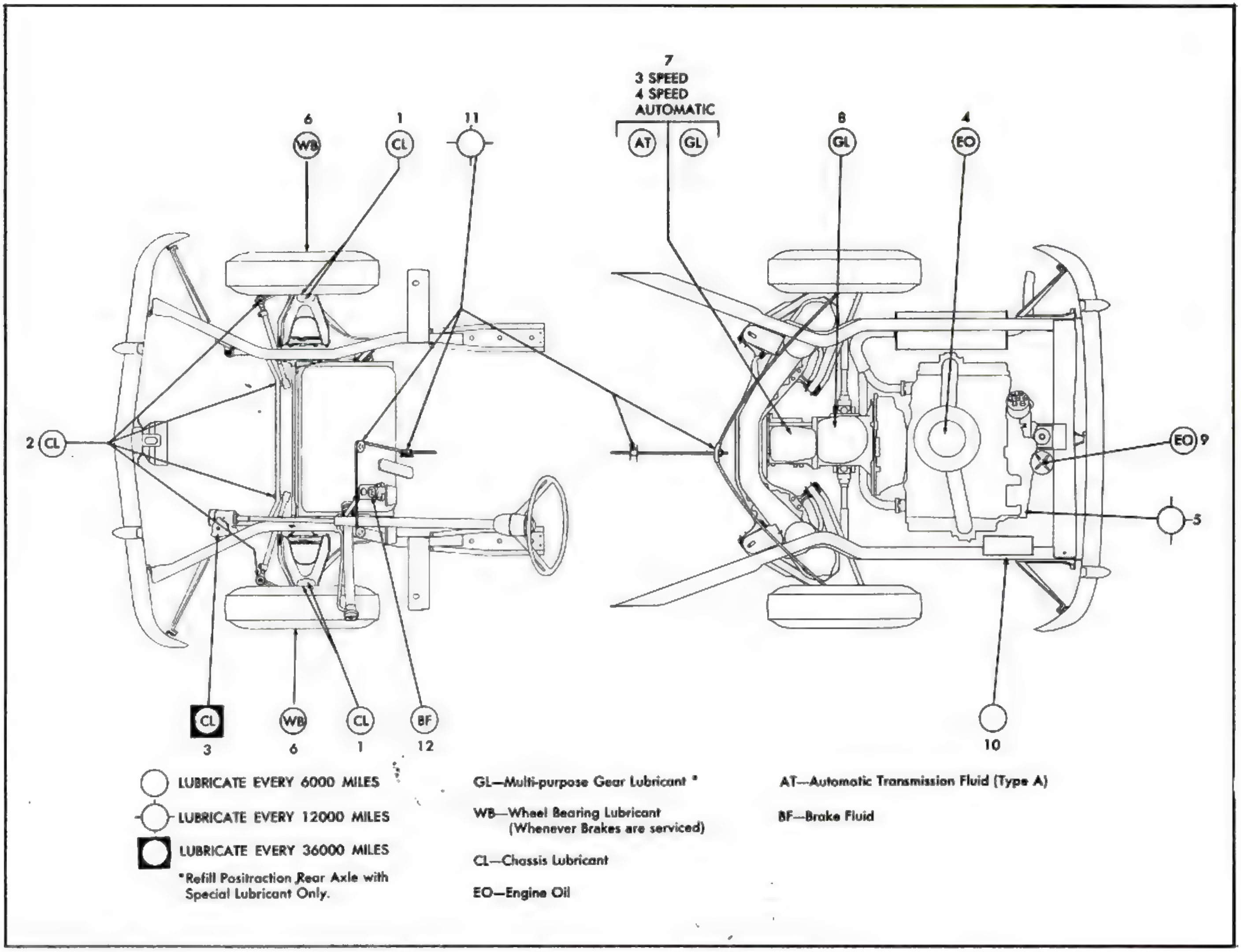


Fig. 17—Corvair Lubrication Diagram

1. Front Suspension
2. Steering Linkage
3. Steering Gear
4. Air Cleaner
5. Engine Oil Cooler
6. Wheel Bearings
7. Transmission
8. Rear Axle
9. Oil Filter
10. Battery
11. Parking Brake and Clutch Cables
12. Brake Master Cylinder

NOTE 1: Lubricate with water resistant EP lubricant.

NOTE 2: Use SAE 80 Multi-purpose Gear Lubricant meeting requirements of U.S. Ordnance Spec. MIL-L-2105B.

NOTE 3: Under prolonged dusty driving conditions it is recommended that this operation be performed more often.

SECTION 3

SUSPENSION

INDEX

GENERAL DESCRIPTION

The Corvair independent front suspension is of the S.L.A. (Short-Long Arm) type with spherical joints connecting the control arms and steering knuckles. The narrow lower control arm is designed so that camber adjustment may be made at the inner pivot by means of an eccentric cam bolt. "Brake dive" and acceleration

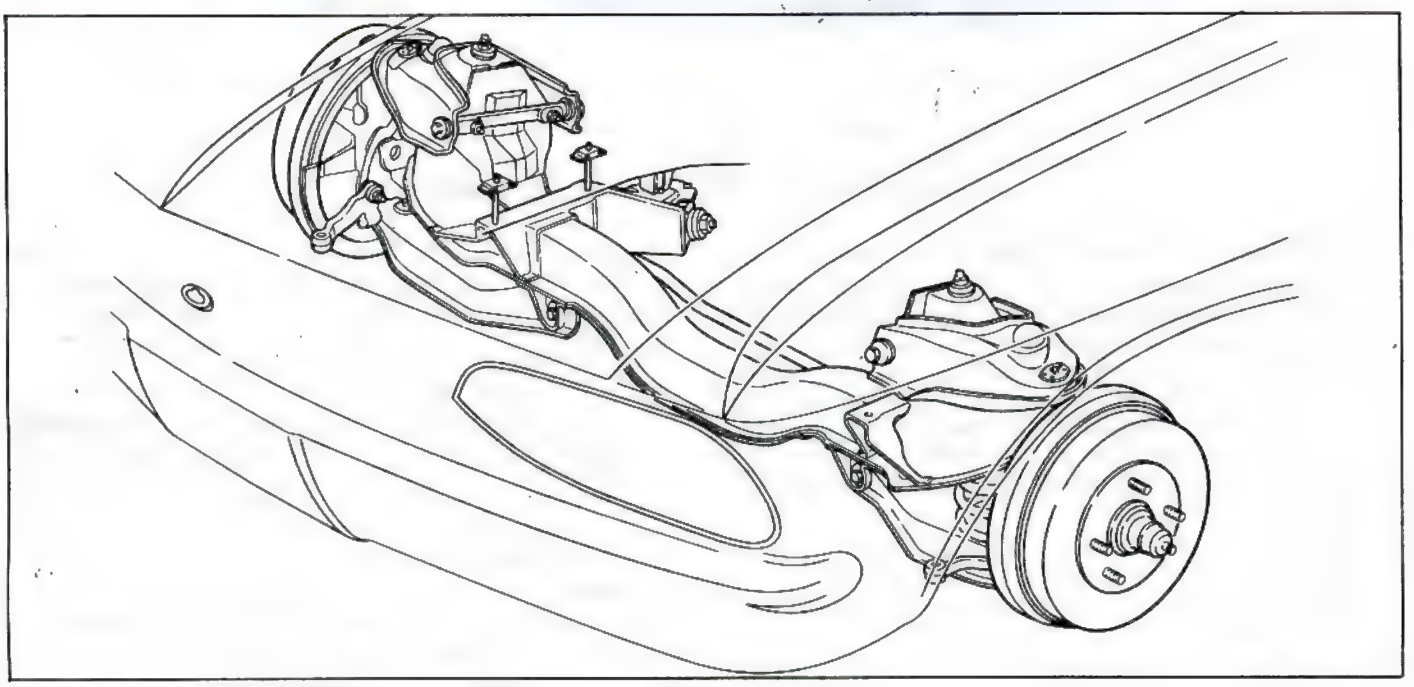


Fig. 3-1—Front Suspension

torque are controlled by strut rods running from the outer ends of the lower control arms to brackets which extend rearward from the front crossmember. These strut rods are adjustable to allow for caster setting. All vehicles are equipped with a stabilizer bar. The rubber jounce bumper encircles the shock absorber shaft and is located between the shock absorber body and the spring tower.

Speedometer drive is from the left front wheel hub grease cap with the cable running through the hole bored through the center of the wheel spindle.

Figures 3-1 and 3-2 illustrate the entire front suspension assembly and a sectioned view of the left side.

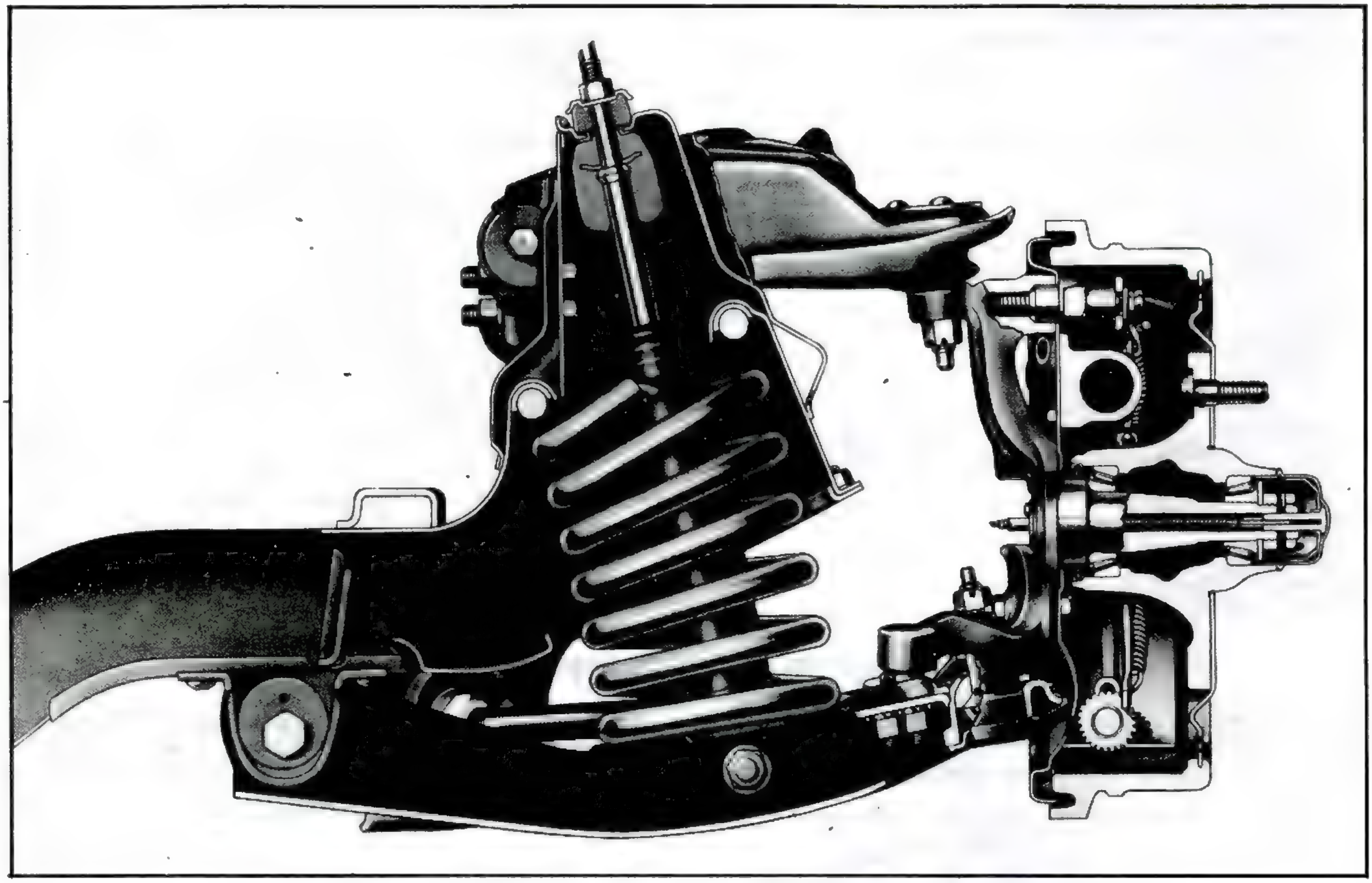


Fig. 3-2—Front Suspension Cross Section

MAINTENANCE AND ADJUSTMENTS

ADJUSTMENT OF FRONT WHEEL BEARINGS

The proper adjustment of the front wheel bearings is one of the important service operations that has a definite bearing on safety. A vehicle with improperly adjusted front wheel bearings lacks steering stability, has a tendency to wander or shimmy and causes excessive tire wear. In an effort to provide for more accurate adjustments, the spindles are drilled both vertically and horizontally and the adjusting nuts are slotted on all six sides.

> **NOTE:** Do not repack or readjust front wheel bearings as part of "New Car Conditioning." This will seriously affect the proper "mating-in" of these close tolerance bearings.

1. Raise and secure front of vehicle. Remove hub cap and dust cap. Use care, when removing the dust cap from the left side, that the plastic speedometer drive insert is not damaged. Remove cotter pin (right wheel) or lock ring (left wheel) from end of spindle.
2. Tighten adjusting nut to 100 lbs. in. while rotating wheel.
3. Back off adjusting nut 1 flat (1/6 turn of nut).
4. Insert cotter pin or lock ring if slot in nut and hole in end of spindle align. If not, back off nut an additional 1/2 flat (1/12 turn of nut) or less and insert cotter pin.
5. Spin the wheel to make certain that it rolls freely. Properly lock the cotter pin by spreading the end and bending it around.

> **NOTE:** These tapered roller wheel bearings should have zero preload and from .001" to .008" end play when properly adjusted.

6. Install dust and hub caps.
7. Repeat operation (if necessary) on opposite side.

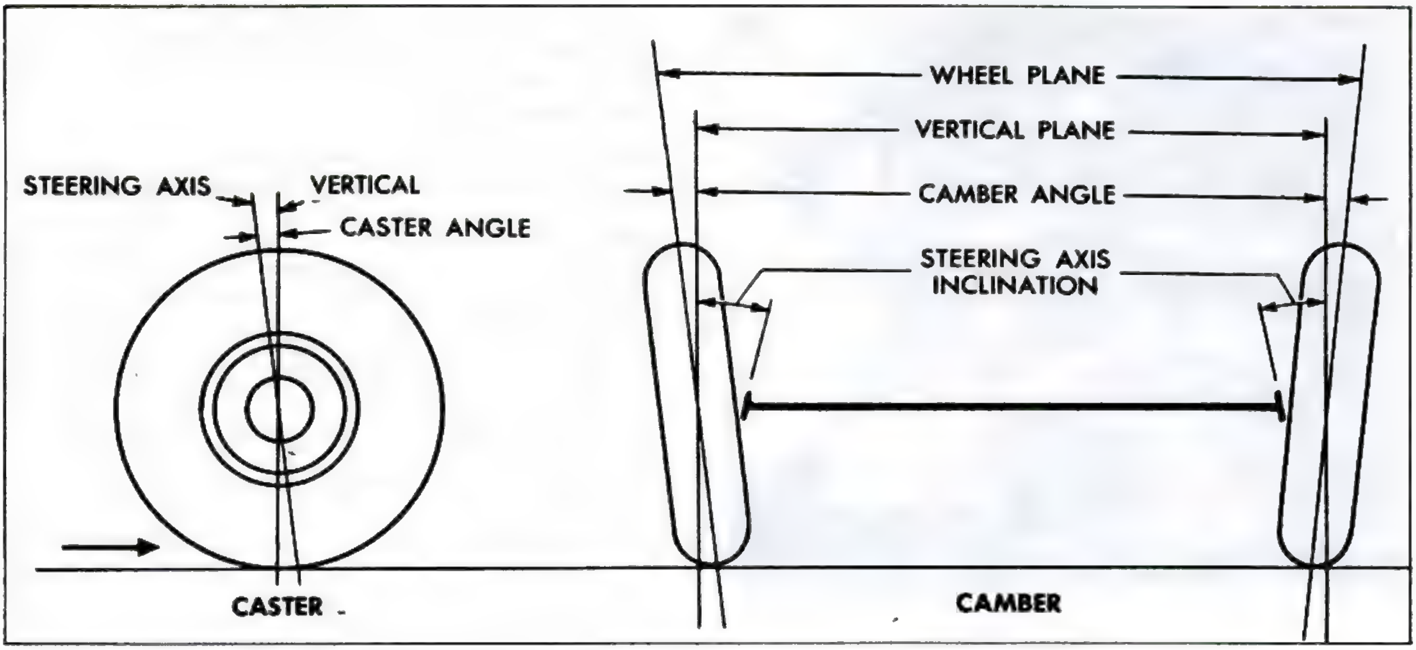


Fig. 3-3—Caster and Camber

8. Lower vehicle to floor.

WHEEL ALIGNMENT

Preliminary Steps

There are several different types of front end alignment machines, all of which outline proper procedure for checking the factors of wheel alignment. The instructions furnished by each manufacturer for the operation of his particular equipment should be followed. Regardless of type of equipment used, all checks must be made with the vehicle level, all tires inflated to their proper pressures and the curb weight of the vehicle on its wheels.

Steering complaints and tire wear are not always the result of improper wheel alignment. Therefore, it is recommended that the following factors be checked and corrected if necessary prior to placing the vehicle on the front end machine.

1. Loose or improperly adjusted steering gear.
2. Steering gear housing loose at frame.
3. Play or excessive wear in spherical joints.
4. Loose tie rod or steering connections.
5. Improper coil spring heights (front or rear).
6. Underinflated tires.
7. Unbalanced tires.
8. Wheel bearings improperly adjusted.
9. Shock absorbers not operating properly.
10. Overinflated front tires.

Camber Adjustment

The camber angle (fig. 3-3) is the angle measured between a true vertical line and a centerline drawn through the vertical plane of the wheel and tire. Camber angle is adjusted by loosening the lower control arm pivot bolt and rotating the cams located on this pivot (fig. 3-4). This eccentric cam action will move the lower control arm in or out, thereby varying camber. The correct camber angle is shown in the Specifications at the end of this book. Camber angles should be within 1/2° from side to side.

NOTE: The steering knuckles in this suspension should never be heated and/or bent in an effort to change front wheel camber. By bending the knuckle, the steering geometry is changed in such a way that the vehicle becomes susceptible to impact shimmy and continual lead. In addition, on vehicles with the front brakes mounted at more than one point on the steering knuckle, bending causes misalignment of brake components and may cause early failure or erratic response.

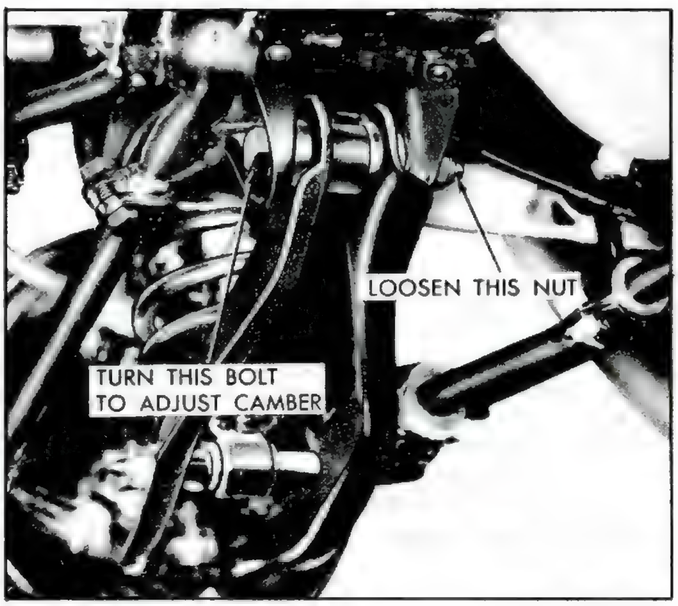


Fig. 3-4—Camber Adjustment

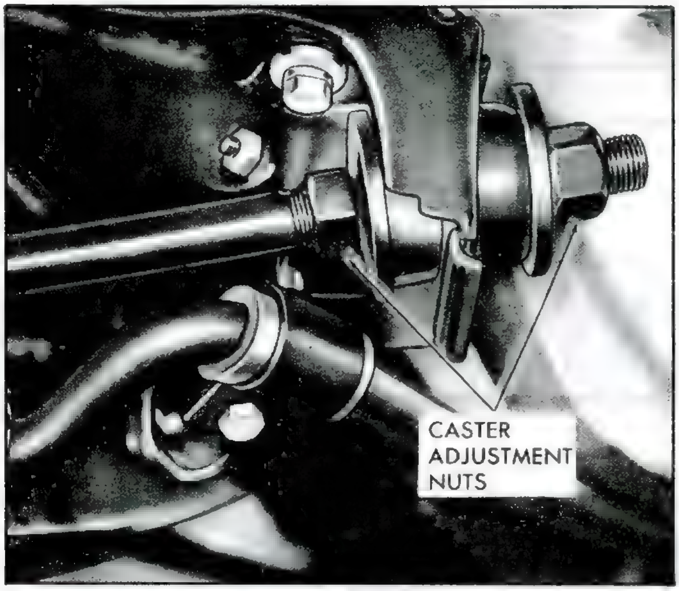


Fig. 3-5—Caster Adjustment

Caster Adjustment

Caster (fig. 3-3) is adjusted by turning the two nuts at the rear of the strut rod (fig. 3-5). Lengthening this rod by turning the nuts increases caster, shortening this rod by turning the nuts decreases caster. Correct caster specifications will be found at the end of this book. Caster angles should be within 1/2° from side to side.

NOTE: Due to manufacturing tolerances, it is possible to "run out of" threads on the strut rod or cause the front coil spring to be cocked in its seat and rub the spring tower. Only when this happens is it permissible to shim unevenly at upper control arm. However, if this is the case, camber must be rechecked.

Steering Axis Inclination

From the definitions of "Steering axis inclination" and "camber", one being the inward tilt of the steering knuckle and the other being the outward tilt of the wheels, (fig. 3-3), it is evident that one cannot be corrected without changing the other. The correct steering axis inclination is shown in the Specifications at the end of this book. If not within limits, the steering knuckle is bent and should be replaced. If a new steering knuckle is installed, caster, camber and toe-in must be readjusted.

Toe-In-Adjustment

Toe-in, shown in the Specifications at the end of this book, can be adjusted by positioning steering gear on high point for straight ahead vehicle travel and then loosening the clamp bolts at each end of each tie rod adjusting sleeve and turning each tie rod sleeve to increase or decrease its length as necessary.

The procedure to be used is dependent upon the type of equipment being used. Using equipment measuring the toe-in of each wheel individually, the following procedure should be used:

1. Position equipment according to manufacturers instructions.
2. Position the steering wheel for straight ahead driving.
3. Loosen the clamp bolt at each end of each tie rod individually and adjust one-half the total toe-in per wheel.
4. Tighten tie rod clamp bolts and remove equipment.

If a tram gauge is utilized, the following procedure should be used:

1. Set wheels in a straight ahead position.
2. Set tram gauge in position according to equipment manufacturers specifications.
3. Loosen the clamp bolts on one tie rod and adjust total toe-in.
4. Loosen opposite tie rod clamp bolts. Turn both tie rods the same amount and in the same direction to place the steering gear on its high point and position the steering wheel for straight ahead driving.
5. Tighten tie rod clamp bolts and remove tram gauge.

Cornering Wheel Relationship

"Cornering Wheel Relationship," or "toe-out on turns," is determined by the angle of the steering arms. If, when checking, "toe-out on turns" does not fall within specifications, it will be necessary to replace the steering arm on the wheel side that does not come within limits.

NOTE: To accurately adjust the front suspension, all extra weight should be removed from the front compartment. The gasoline tank should be full.

SERVICE OPERATIONS

To overhaul the front suspension or to perform various major service operations, it will be desirable to raise car on a hoist. The suspension should be allowed to swing free. If a twin post hoist or similar equipment is used, it will be necessary to support the front of the vehicle at the forward end of the body side rail extension (each side) with jackstands and lower front of hoist. See "Lifting Corvair With Hoist" in Section O.

SPEEDOMETER CABLE

The speedometer drive is from the left front wheel in the 1965 Corvair rather than from the transmission output shaft as in past models. See Figure 3-6. The speedometer cable runs to the inside of the wheel where it is bracket mounted to the steering knuckle. The cable then runs through a hole drilled in the spindle. The square end of the cable pilots into the square center hole of a plastic insert which is part of the hub grease cap. The usual cotter pin cannot be used to lock the spindle nut in place because of the cable through the spindle. In its place a special lock ring is used on the left spindle nut only. When performing the following service operations keep in mind these differences, especially the plastic insert in the hub grease cap. Removal and installation of the cap should be performed with care so as not to damage the insert.

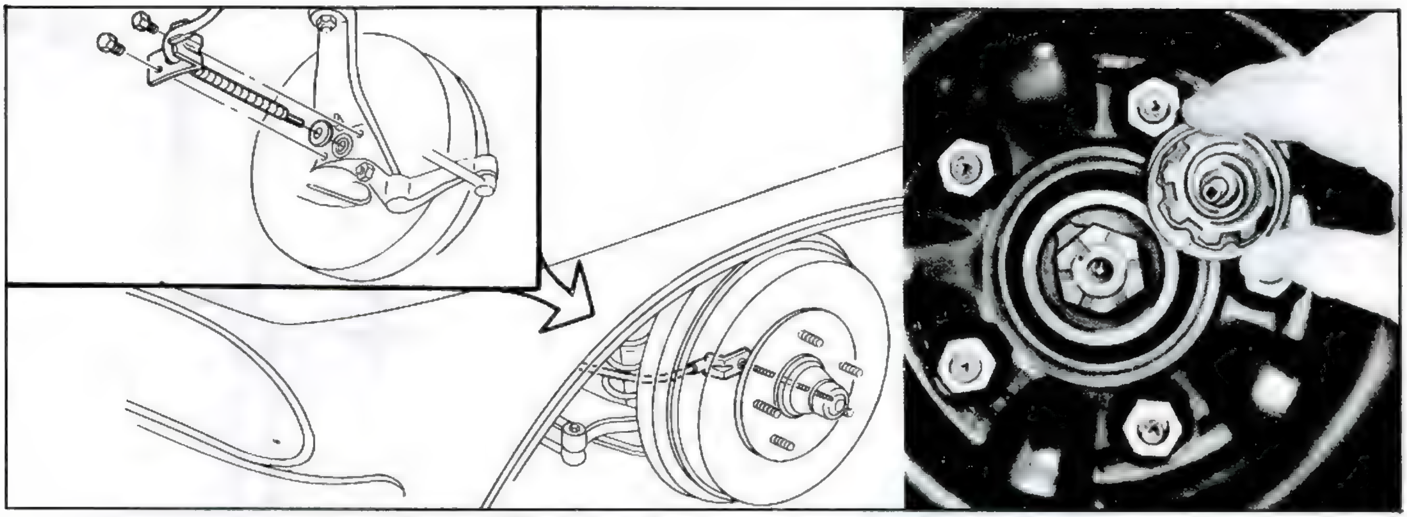


Fig. 3-6—Speedometer Cable

Removal

1. Remove the two speedometer cable bracket to steering knuckle attaching screws and carefully pull the cable and seal from the spindle.

Installation

1. Remove the hub cap or wheel cover from the left front wheel and then carefully pry the grease cap from the wheel hub.
2. With the seal in place over the speedometer cable, carefully slide the cable into the hole in the spindle and attach the bracket to the steering knuckle with its two attaching screws (30-50 lbs. in. torque).
3. Reinstall the grease cap as follows: set the cap in place over the hub and rotate it with your fingers until you feel the speedometer cable enter the plastic grease cap insert. Then, using a screwdriver, carefully tap around the bead of the cap until it is seated. (If available, Tool J-6417 may be used to install the grease cap.)

CAUTION: Do not pound on the end of the cap.

FRONT HUB AND BRAKE DRUM

The front hub and brake drum are separate components and may be easily separated after removing the wheel nuts and wheel.

Removal

1. Remove hub caps, break loose (less than one full turn) the wheel to hub bolt nuts, raise vehicle from floor, place on jack stands and remove wheels.
2. Remove brake drum, hub grease cap, (use care when removing the left front grease cap) cotter pin or lock ring, spindle nut, spindle washer and remove hub assembly. Do not allow roller bearing to fall out onto floor and become damaged.

NOTE: In some cases it may be necessary to back off brake adjustment because of scored drums or badly worn linings.

3. Remove outer bearing from hub. The inner bearing will remain in the hub and may be removed by prying out the inner bearing seal assembly. Discard old seal.
4. Wash all parts thoroughly in cleaning solvent.

Inspection

1. Check all bearings for cracked bearing separators or worn or pitted rollers.
2. Check bearing outer races for cracks or pitting.
3. Check brake drum for out of round or scored condition.
4. Check bearing outer face for looseness in hub.

Repairs

Replacement of Bearing Races

1. Using steel bar stock, make press-out tools shown in Figure 3-7.

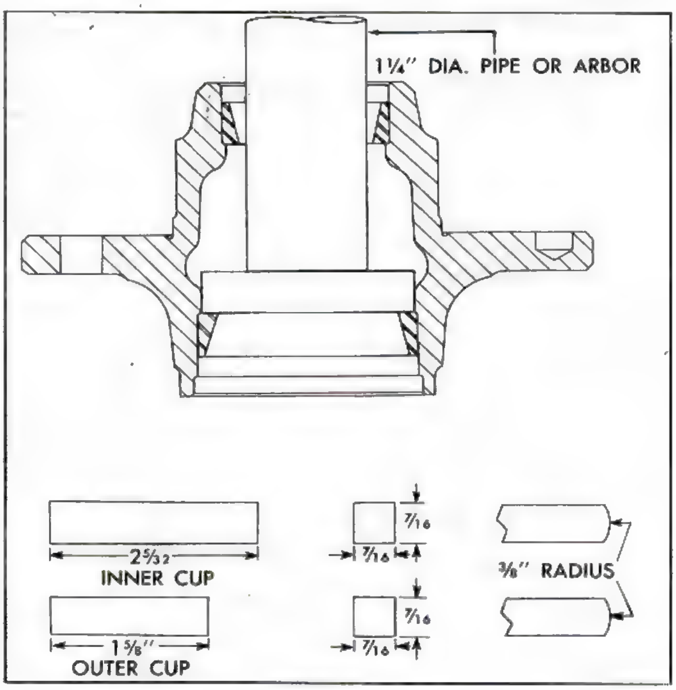


Fig. 3-7—Bearing Cup Removing Tools

Fig. 3-8—Installing Bearing Cups

2. Place appropriate tool behind bearing cup, indexing tool in provided notches, and press out cup with arbor press.
3. Install new bearing cup in hub using Tool J-8849 on the outer race and Tool J-8850 on the inner race. Tool J-8092 (Driver Handle) must be used with the above installers (fig. 3-8).
4. Make certain that the cup is not cocked and that it is fully seated against shoulder in hub.

Replacement of Wheel Hub

1. Remove inner and outer bearing cups as outlined previously.
2. When installing a new hub, it is necessary to install new studs (fig. 3-9). They may be easily removed and installed on an arbor press. Place a socket under the stud being removed or installed and bring the press ram in direct contact with the stud shank or head. Be sure the head is in full contact with the hub flange when installation is complete.
3. Install bearing cups into hub.

Installation

1. Hand pack both inner and outer bearings, using a high melting point wheel bearing lubricant.
2. Place inner bearing in hub, and install a new inner bearing seal assembly. Side of seal with bent lugs should be up as installed, or toward center of the vehicle.
3. Carefully position hub on spindle.
4. Install outer bearing, pressing it firmly into the hub by hand.
5. Install spindle washer and spindle nut. Draw spindle nut up snug and adjust bearings as outlined under "Adjustment of Front Wheel Bearings."
6. Using a piece of fine sand paper, lightly sand the inside braking surface of brake drum to insure a clean surface and proper brake operation. Using

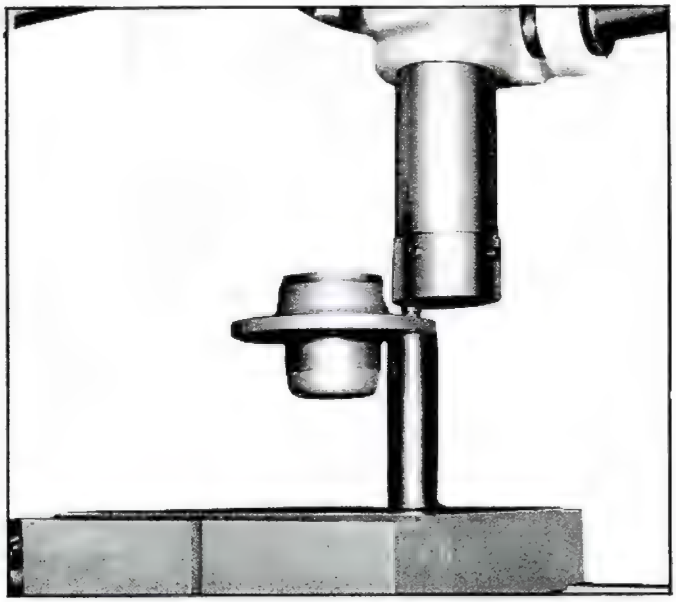


Fig. 3-9—Installing Hub Bolts

compressed air, blow all loose foreign material from drum. Do not use a cloth and attempt to wipe out drum as the braking surface may become contaminated with grease, oil, etc., from the cloth.

FRONT SHOCK ABSORBERS

Removal

1. Hold shock absorber upper stem on flat section and remove upper attaching nut, cup washer and grommet (fig. 3-10).

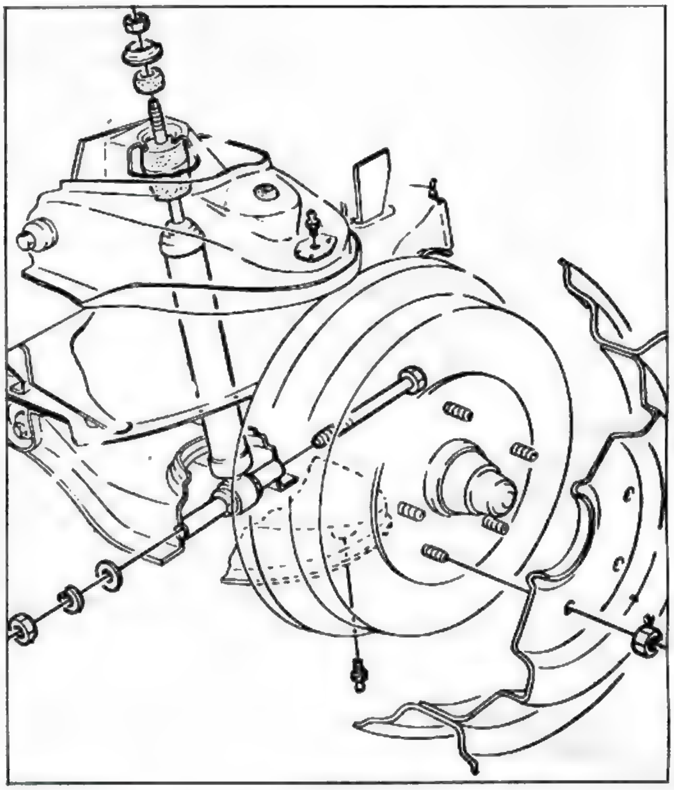


Fig. 3-10—Shock Absorber Installation

2. Properly support vehicle with hoist and/or jack stands so that front suspension "hangs free" and so that clearance is sufficient on front lower control arms to allow removal of shock absorber.
3. Remove the shock absorber lower attaching bolt, nut and lock washer and flat washer.
4. Withdraw shock absorber and bumper.

Installation

1. Install bumper on shock absorber shaft. Pull out shaft to extend it to its full length.
2. Install shock absorber up through lower control arm and through coil spring. Be certain shaft protrudes out of small hole in top of spring tower.
3. Install lower attaching bolt, flat washer, lock washer and nut.
4. Lower vehicle to floor.
5. Holding upper flat, install upper retaining nut.

STEERING KNUCKLE

It is recommended that the vehicle be raised and supported on a twin post hoist so that the front coil spring remains compressed, yet the wheel and steering knuckle assembly remain accessible. If a frame hoist is used, support lower control arm with an adjustable jackstand to safely retain spring and lower control arm in their curb height position.

Removal

1. Raise vehicle and support lower control arm as noted above.
2. Remove hub cap, wheel hub dust cap, cotter pin (right side) or lock ring (left side), wheel bearing adjusting nut and washer, and remove wheel, tire, brake drum and wheel hub from the spindle.

   CAUTION: Use care when removing the left dust cap that no damage is done to the plastic speedometer cable drive insert in the cap.

3. Remove brake shoes.

   CAUTION: Keep brake shoes clean and dry.

4. Remove brake anchor pin and two bolts securing brake backing plate and steering arm to steering knuckle.
5. Withdraw steering arm and brake backing plate from steering knuckle. Wire backing plate to sheet metal. Do not disconnect brake line.

   NOTE: Refer to Section 4--Steering, Service Operations entitled Steering Linkage--Tie Rod, for further steering arm service operations.

6. If working on the left steering knuckle, remove the two bolts attaching the speedometer cable bracket to the knuckle and carefully remove the cable.
7. Remove upper ball stud cotter pin and nut. Strike steering knuckle upper boss, backing up with another hammer, to loosen ball stud.
8. Remove lower ball stud cotter pin and nut. Strike steering knuckle lower boss as in Step 7 above. Raise up and withdraw steering knuckle.

Installation

1. Place steering knuckle over lower ball stud, install nut and tighten 30-40 lbs. ft. Insert new cotter pin.
2. Drop upper control arm ball stud into steering knuckle upper boss, install nut and tighten 30-40 lbs. ft. Insert new cotter pin.
3. On left knuckle, carefully insert the speedometer cable into the hole through the center of the spindle and attach the bracket with two bolts. Torque to 30-50 lbs. in.
4. Assemble backing plate to steering knuckle with brake anchor bolt.
5. Assemble steering arm to steering knuckle and insert steering arm bolts and lock nuts through backing plate, steering knuckle and steering arm. Tighten nuts 40-50 lbs. ft.
6. Tighten brake anchor bolt to 70-90 lbs. ft.
7. Install brake shoes.
8. Install wheel hub assembly over steering arm spindle. Then install washer and wheel bearing adjusting nut, brake drum, wheel and tire.
9. Adjust bearings. Insert new cotter pin, dust cover and hub cap. On the left side of vehicle, be sure that the speedometer cable end is correctly positioned in the plastic insert in the left side dust cover.
10. Remove adjustable jackstand and lower vehicle.
11. Recheck and readjust front wheel alignment where necessary.

SPHERICAL JOINTS

Lube Fittings

Special self threading type lube fittings are used in the spherical joint assemblies. If it is necessary to replace a fitting a standard threaded type may be used. However, replacement spherical joint assemblies are supplied less the lube fitting. Therefore it will be necessary to install a self threading type fitting into the untapped hole provided when replacing the entire assembly.

Inspection

Upper

The upper spherical joint is checked for wear by checking the torque required to rotate the ball stud in the assembly. Use the following procedure:

1. Support vehicle weight at outer end of front suspension lower control arm.
2. Remove wheel and tire assembly.
3. Remove cotter pin and nut from upper control arm ball stud.
4. Back up the knuckle with a hammer and tap with another hammer to break the stud loose, then remove the stud from the steering knuckle.

   CAUTION: Use care when striking the knuckle that the seal is not damaged.

5. Raise control arm to clear knuckle. Install a stud nut on the stud and measure the torque required to turn the stud in the assembly with a torque wrench. This should be a minimum of 2 lbs. ft. If excessive wear is indicated in upper joint, both upper and lower joints should be replaced. If a tight joint is suspected, 4 lbs. ft. is the maximum allowable torque with the joint well lubricated.
6. Lower control arm and install joint into knuckle. Install nut and cotter key. (If joint is to be replaced, cotter key need not be installed at this time. For replacement see "Upper Control Arms, Spherical Joints, Cross Shaft and/or Bushings").

7. Install the wheel and tire assembly.
8. Lower vehicle to floor.

Lower

The lower control arm spherical joint should be replaced whenever wear is indicated in the upper joint inspection.

> **NOTE:** The lower control arm spherical joint is a loose fit in the assembly when not under load.

Only if inspection of each upper joint indicates them both to be within limits, inspect each lower joint for excessive wear as follows:

1. Support vehicle weight on wheels or wheel hubs.
2. With outside micrometer or caliper, measure distance from tip of lubrication fitting to upper surface of ball stud (fig. 3-11) and record the dimensions for each side.

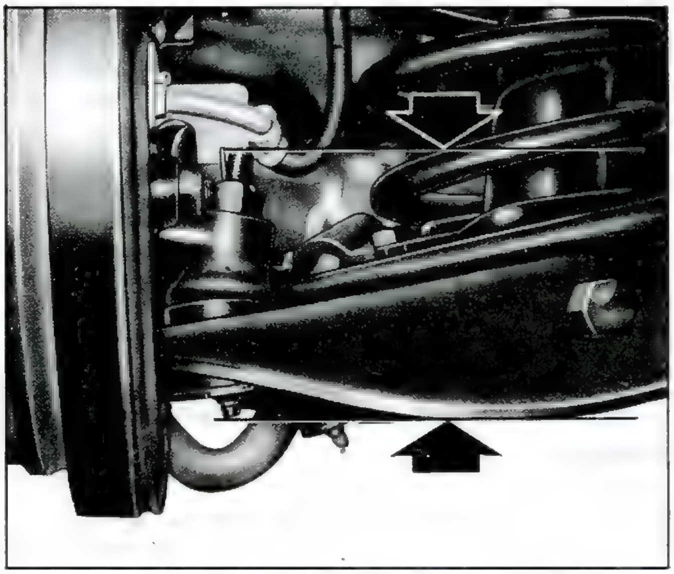


Fig. 3-11—Checking Lower Spherical Joint

3. Then support vehicle weight at outer end of each lower control arm, so that wheels or wheel hubs are free, then repeat Step 2.
4. If the difference in dimensions on either side is greater than 1/16" (.060"), the joint is excessively worn and both lower joints should be replaced.

If inspection of lower spherical joints does not indicate excessive wear, inspect further as follows:

5. Examine lubrication hole in each joint assembly after cleaning out hole. Look for evidence of the liner partially or fully blocking lubrication opening. Such evidence indicates that liner is disintegrating and that both lower spherical joints should be replaced.

Another indication of lower spherical joint excessive wear is indicated when difficulty is experienced when lubricating the joint. If the metal liner has worn to the point where the lubrication grooves in the liner have worn away, then abnormal pressure is required to force lubricant through the joint. This is another reason to recommend replacement of both lower joints.

If the above inspections do not indicate any reason for spherical joint replacements, test the torque tightness of the lower ball stud on each side as follows:

1. Wire-brush off nut and cotter pin attaching sperical joint ball stud to steering knuckle and examine for evidence of looseness of stud in knuckle.
2. If no evidence of looseness, remove cotter pin and with prick punch or equivalent, mark nut and stud to identify relative location later.
3. Tighten attaching nut to original position and observe torque reading. If less than 45 lbs. ft., stud may have been loose in steering knuckle and replacement of both spherical joints should be recommended. See "Removal" and "Installation" of Spherical Joint.

STABILIZER BAR

Located to the rear of the front wheels, the front stabilizer is a steel bar interconnecting each lower control arm. It is attached directly to the arms through rubber bushings held in place by stamped brackets. Rubber bushed links bolted to the front cross-member support the center portion of the bar. Figure 3-12, illustrating the points of attachment of the bar, may be used for reference during removal and installation procedures.

The stabilizer bar support with its upper bushing is serviced as an assembly. The support to stabilizer bar bushing as well as the stabilizer bar to lower control arm bracket bushing may be replaced.

STRUT ROD

Removal

> **NOTE:** The vehicle need not be raised, but for working clearance it may be desirable.

1. Remove the two nuts, bolts and lock washers that secure the front end of strut rod to lower control arm, and remove the arm stop bracket.

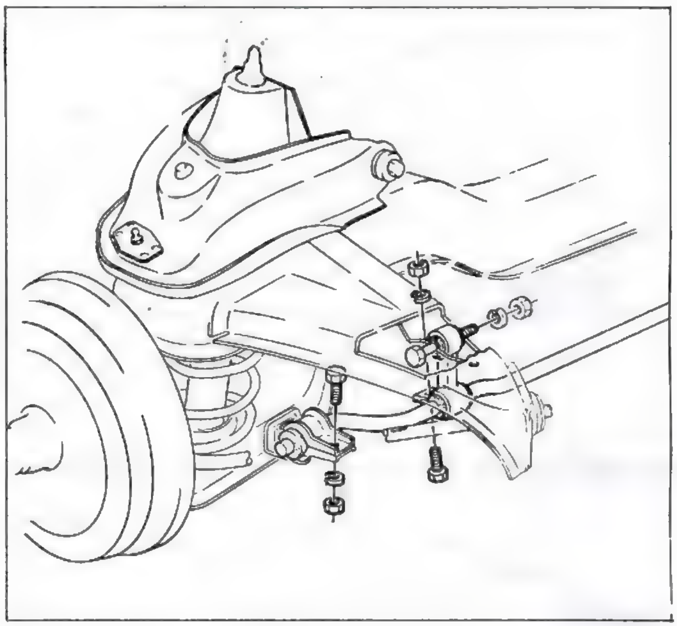


Fig. 3-12—Stabilizer Bar Attachment

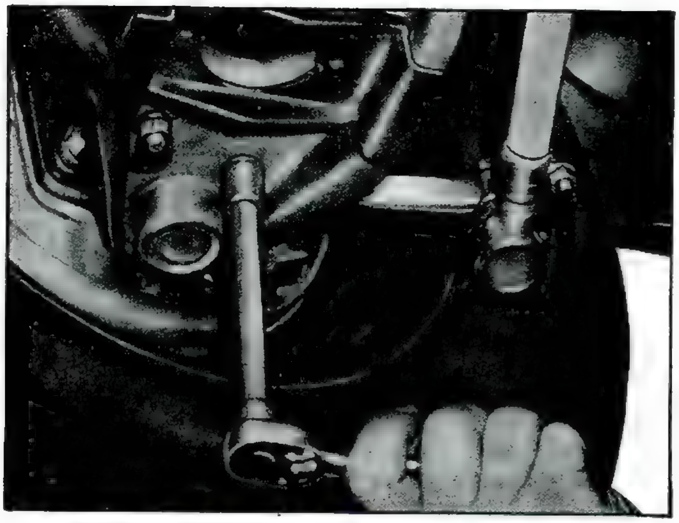


Fig. 3-13—Removing Strut Rod Nut

NOTE: There is slight tension on the rod caused by the rubber grommets at rear of strut rod.

2. Remove the nut, washer and grommet from rear end of strut rod (fig. 3-13).
3. Withdraw strut rod from crossmember bracket. Remove rubber grommet, spacer, washer and nut from rod.

Installation

1. Install the forward nut onto the rod. Position it about 1" from front end of threads. Install the nut, washer, spacer and grommet.
2. Set strut rod in place in crossmember bracket. Install the remaining grommet, washer and nut. Snug up the rear nut.
3. Install the rod and arm stop bracket to the lower control arm with the attaching bolts, lock washers and nuts.
4. Lower vehicle to floor (if raised) and reset caster as outlined earlier in this section.

RIDING HEIGHT AND COIL SPRING SAG

In cases of vehicle riding height complaints, a coil spring height check will show if the front suspension is at the proper height.

1. Position car on smooth, level floor. The vehicle should be at curb weight (a full tank of gasoline but an empty front compartment, except for spare tire when installed in the trunk).
2. Bounce and rock the car several times and allow it to settle to a normal height.
3. Measure the distance from the floor of shop area to the top of the wheel well opening at the centerline of the front wheel (fig. 3-14).
4. Correct measurement will be found in the Specifications at the rear of this book.
5. Measure the opposite side of the vehicle in a similar manner. It is essential that the two differences be within 1/2".
6. To correct the height, springs must be replaced. These springs do not have flat ends and shims must not be used.

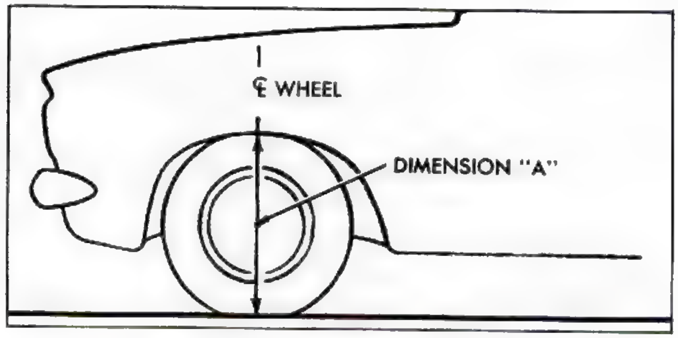


Fig. 3-14—Checking Riding Height

NOTE: This check should be used in conjunction with the rear spring check to be certain that overall "sag" (trim) is within 1/2".

FRONT COIL SPRINGS, LOWER CONTROL ARMS, SPHERICAL JOINTS AND/OR BUSHINGS

See preceding "Riding Height and Front Coil Spring Sag" checking procedure. If in doubt as to condition of spherical joints, proceed as outlined under "Inspection of Spherical Joints".

Removal of Coil Spring

1. Place vehicle on suitable hoist or jackstands. The front control arms must be allowed to swing free and positioned so that they (the control arms) may be raised or lowered with the hoist (front post on a twin post, etc.) or floor jack.
2. Remove shock absorber as outlined previously.
3. Loop Cable J-4988, or suitable chain, up around the third spring coil and, using a 1/2" nut and bolt, attach the cable through one of the shock absorber lower bolt holes (fig. 3-15).
4. Remove the two strut rod to control arm, nuts, bolts and lock washers and the arm stop bracket.

NOTE: The strut rod is under slight tension from the rubber grommet on opposite end.

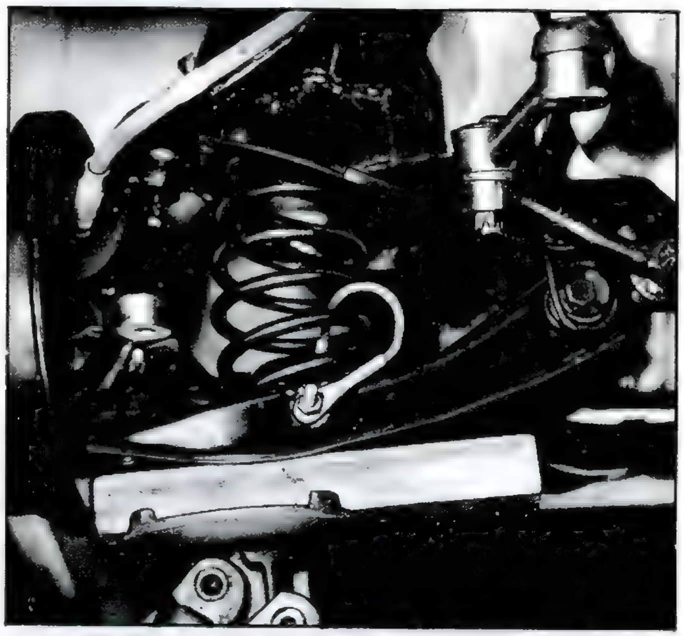


Fig. 3-15—Tool J-4988 Installed

5. Remove the stabilizer rod to lower control arm nut, bolt, lock washer and clamp. Pull bushing far enough so that it does not contact the bracket.
6. Place floor jack or front post of hoist under control arm. Take up slightly on spring compression.
7. Remove the lower ball stud cotter pin and attaching nut. Back up knuckle with hammer and tap with another hammer to break ball stud loose.
8. Carefully lower hoist or floor jack until spring is free. See Figure 3-16. Remove cable or chain installed in Step 3 and withdraw spring.

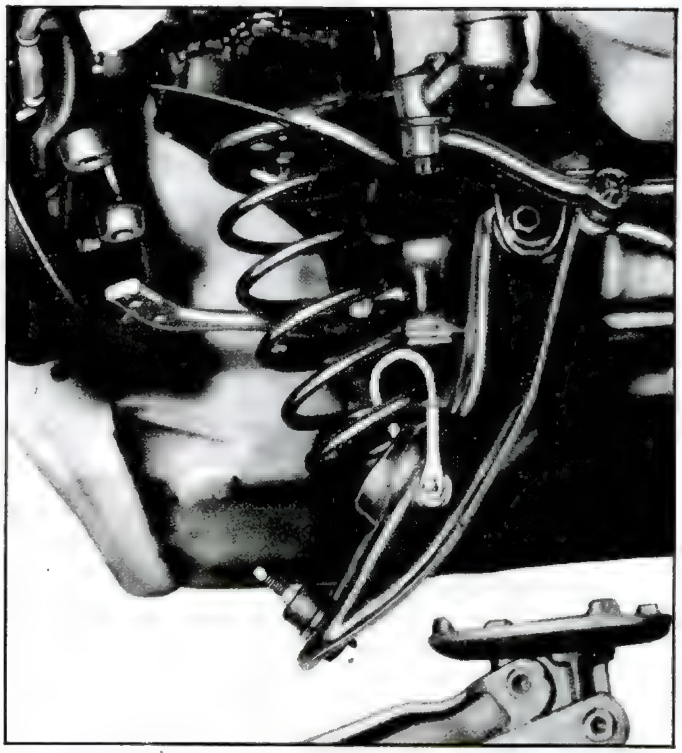


Fig. 3-16—Spring Relaxed

Removal of Control Arm

9. Scribe the location of the inner pivot bolt cam so that it may be reinstalled in exactly the same position. Then remove the inner pivot nut, lock washer, outer cam and the adjusting cam bolt assembly. See Figure 3-17.
10. Remove the control arm.

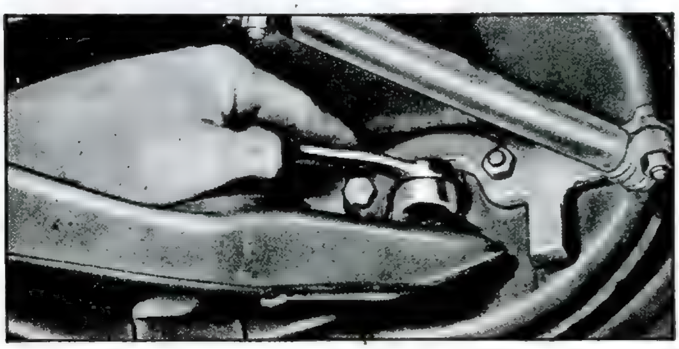


Fig. 3-17—Removing Lower Control Arm

Removal of Spherical Joint

Spherical joint removal is performed in the same manner whether the control arm has been removed from the vehicle or not. If the arm has previously been removed it may be supported in a vise.

To remove the joint with the arm installed in the vehicle, support the lower control arm at its outer end with a hoist or floor jack located clear of the joint and remove the wheel and tire. Remove the upper and lower ball stud nuts and free the studs from the knuckle, then wire the knuckle and brake drum assembly out of the way.

11. With a screw driver, pry off the seal and retainer.
12. Install Tools J-9519-10, J-21058-6 and a 7/8" (1/2" drive) deep socket as shown in Figure 3-18.
13. Turn down on the hex head screw until the spherical joint is pushed out.

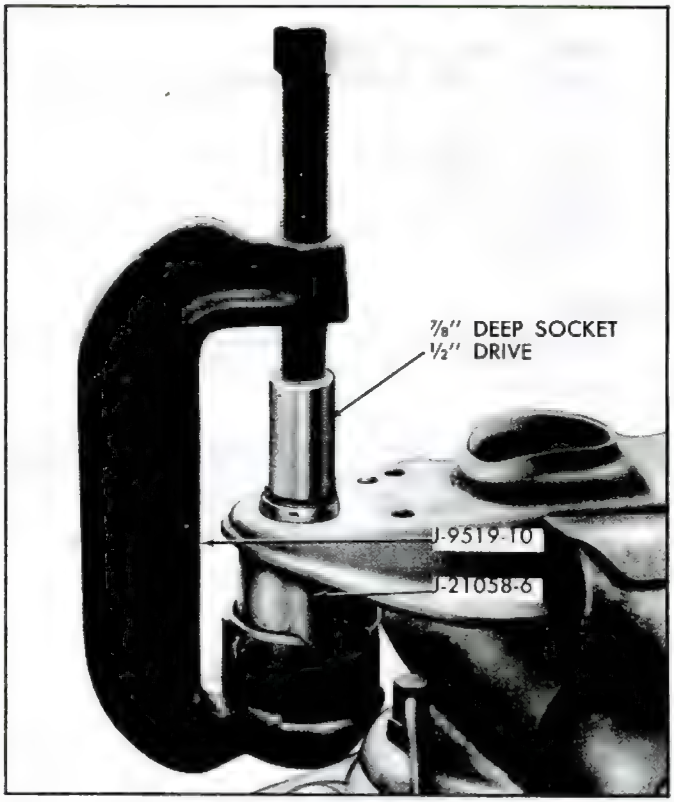


Fig. 3-18—Removing Spherical Joint

Installation of Spherical Joint

14. Start the replacement ball stud into the control arm and install Tools J-9519-10, J-9519-16 and J-21058-6 as shown in Figure 3-19.
15. Turn down the hex screw until the ball stud is seated properly in the control arm.
16. Install the studs in the steering knuckle, secure in place with the attaching nut, tighten nut and install the cotter pin.
17. Replace the wheel and tire.
18. Lower the vehicle to the floor.

Removal of the Control Arm Bushing

19. With the control arm removed from the vehicle, set up the removal tools as shown in Figure 3-20.

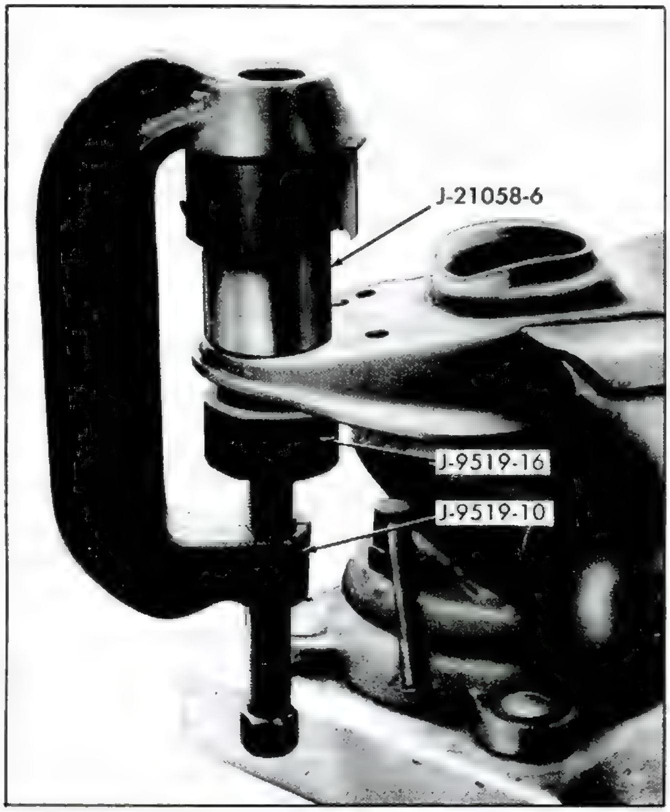


Fig. 3-19—Installing Spherical Joint

Notice that the bushing must be pressed from the front of the control arm (the side opposite the stabilizer bar bracket) on the end of the bushing that does not have the large collar on the outer shell.

20. Turn down the hex head screw until the bushing is pressed free.

Installation of Control Arm Bushing

21. With the bushing hand-started into the control arm, set up the installation tools as shown in Figure 3-20. Notice that the bushing must be pressed into the arm from the rear (the side on which the stabilizer bar bracket is mounted) and that the bushing must be pressed from its flanged end.
22. Turn down on the hex head screw until the bushing flange is seated flush on the control arm.

Installation of Control Arm

23. With the bushing installed and both bushing caps in place, insert the arm into the crossmember bracket.
24. Install the cam adjusting bolt, outer cam, lock washer and loosely install the nut.
25. Line up the camber adjusting cams with the scribe marks made during the removal procedure.
26. Install the spherical joint stud into the steering arm and tighten the nut to 30 to 40 ft. lbs. torque.
27. While holding the cam adjusting bolt with a wrench to keep it from turning tighten the nut to 90-120 ft. lbs. torque.

Installation of Front Coil Spring

28. Place spring up into spring tower, determine its proper positioning, and then rest its lower end on the lower control arm spring seat. Then install Cable J-4988 or a suitable length chain around the third coil of the spring and secure to one of the shock absorber bolt holes by means of a 1/2" nut and bolt. See Figure 3-21.

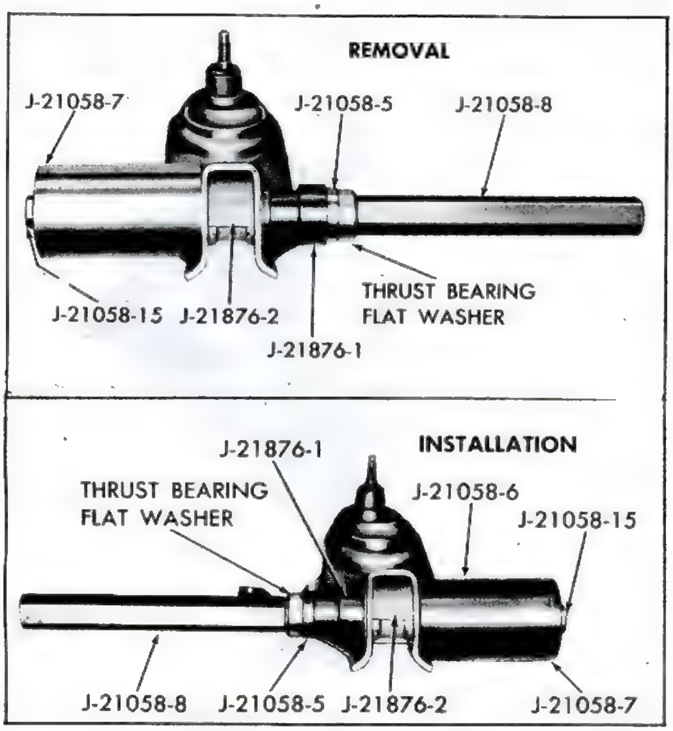


Fig. 3-20—Removing and Installing Lower Control Arm Bushings

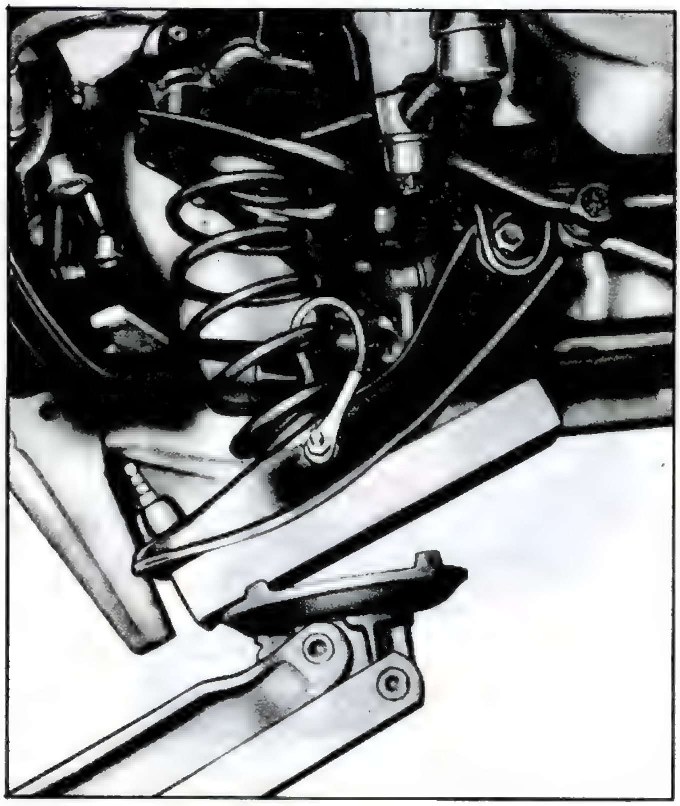


Fig. 3-21—Installing Coil Spring

29. Install the stabilizer bar to lower control arm bracket bushing.
30. Raise control arm, line up the ball stud and steering arm and install the nut. Tighten the nut to 30-40 ft. lbs. torque and install the cotter pin.

    NOTE: A wooden block between the lift and the control arm will make this lifting operation easier.

31. Attach strut rod and arm stop bracket to control arm with two attaching bolts, nuts and lock washers.

    NOTE: The tension in this rod is due to the rubber grommet at the opposite end of rod. Do not touch the large nuts at grommet end as these control caster adjustment.

32. Install stabilizer bar clamp, nut, bolt and lock washer over the stabilizer bar bushing. Torque to 100-140 in. lbs.
33. Install the shock absorber as outlined previously.
34. Lower vehicle to floor.

UPPER CONTROL ARM, SPHERICAL JOINT, CROSS SHAFT AND/OR BUSHINGS

Removal of Control Arm Assembly

1. Support vehicle weight at outer end of lower control arm.
2. Remove wheel and tire assembly.
3. Remove cotter pin and nut from upper control arm ball stud.
4. Break the stud loose from the knuckle by backing up the knuckle with a hammer and tapping with a second hammer.
5. Remove two nuts retaining the upper control arm cross shaft to front crossmember. Note number of shims at each bolt if any are present.

   NOTE: It is unlikely that any shims will be found at this location. See "Caster Adjustment" in this Section.

Removal of Spherical Joint

If spherical joint is to be replaced, follow Steps 6-9 (see "Inspection of Spherical Joints"). If it is not to be replaced omit these steps and proceed with Step 10.

6. Prick punch the center of the four rivets.
7. Drill through the heads of these rivets.
8. Using a sharp cold chisel cut off rivets being careful not to enlarge holes in control arm.
9. Tap out rivets with a punch and remove joint from control arm.

Removal of Cross Shaft and/or Bushings

If the bushings and shaft are not to be removed, omit the following steps.

10. Remove bolts, lock washers, and collars from both ends of cross shaft.
11. Install a 5/16"-24 bolt in end of cross shaft.
12. Set arm in place on Tool J-5888-3 and press out bushing as shown in Figure 3-22.
13. Turn control arm over (as shown in Figure 3-22) and using Tool J-8345-3 and Tool J-7079-2, press out second bushing using J-5888-3 as a support.

Installation of Cross Shaft and/or Bushings

If bushings or shaft were removed, proceed as outlined below. If bushings or shaft were not removed, omit Steps 1-4.

1. Set control arm in place on Tool J-5888-3. Using Tool J-7079-2 and J-8345-2, press control arm bushing into place (fig. 3-23).
2. Install cross shaft in arm, invert in press and, with Tool J-8345-1 in place to keep arm from flexing, press in second bushing.
3. Cross shaft should be able to be turned by hand.
4. Install collar, lock washer and bolt in ends of cross shaft. Do not tighten at this time.

Installation of Spherical Joint

If the spherical joint was removed, proceed with Steps 5-6. If the spherical joint was not removed, omit these steps.

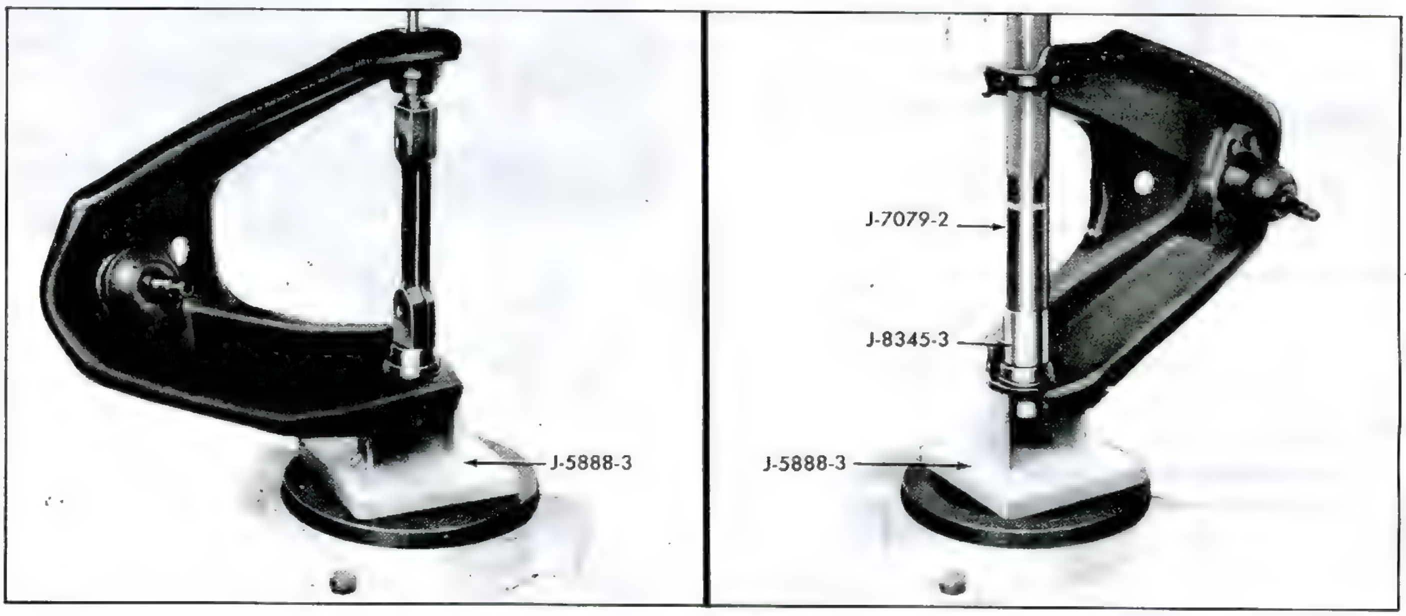


Fig. 3-22—Removing Upper Control Arm Bushings

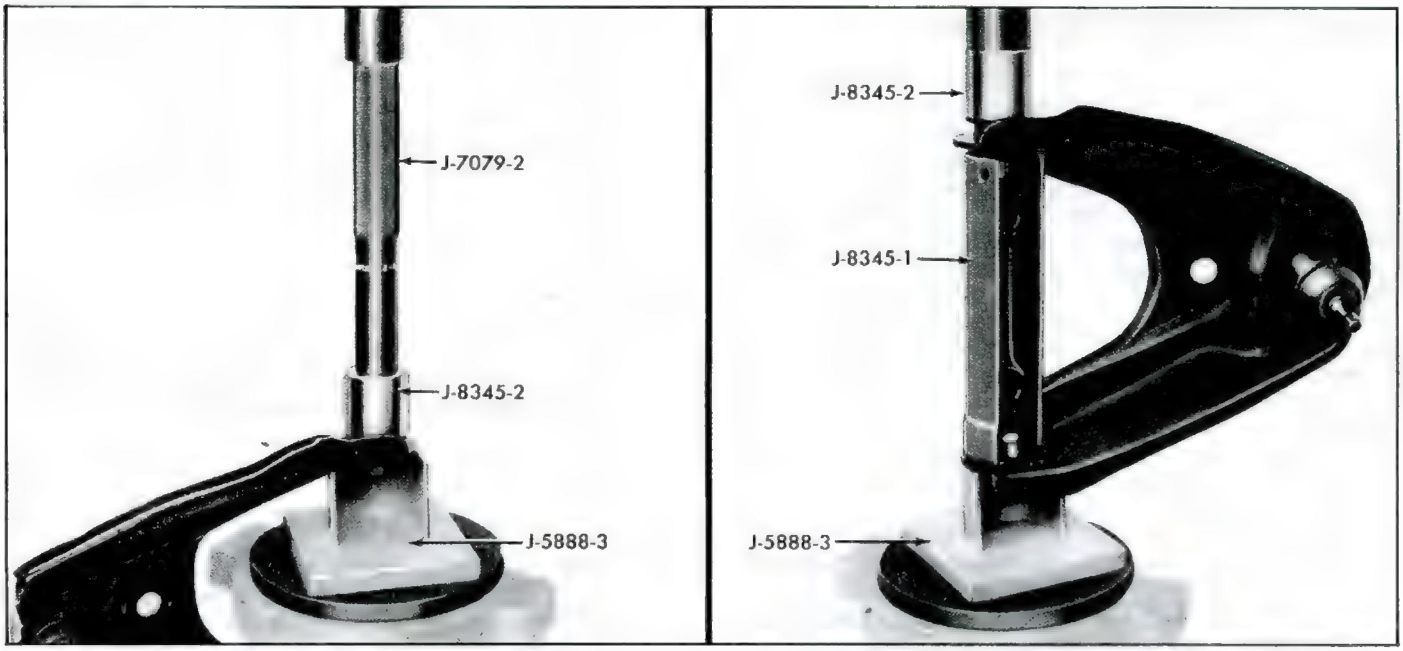


Fig. 3-23—Installing Upper Control Arm Bushings

5. Install new joint against top side of upper control arm. Secure joint to control arm with the four special alloy nuts and bolts furnished with replacement part.

   CAUTION: Use only alloy bolts supplied for this operation.

6. Tighten these nuts to 20-25 lbs. ft. torque.

If the cross shaft bushings or spherical joint were not removed, omit Steps 1-6 and start procedure with Step 7.

Installation of Control Arm Assembly

7. Install upper control arm to vehicle.
8. Install two nuts and lock washers to the studs retaining upper control arm shaft to front cross-member. Replace any shims previously removed.
9. Install ball stud through knuckle, install nut, tighten to 30-40 lbs. ft. and install cotter pin.
10. Install wheel and tire assembly.
11. Lower vehicle to floor.
12. Bounce front end of vehicle to centralize bushings and tighten cross shaft bolts to 35-40 ft. lbs.
13. If spherical joint was replaced recheck caster and camber.

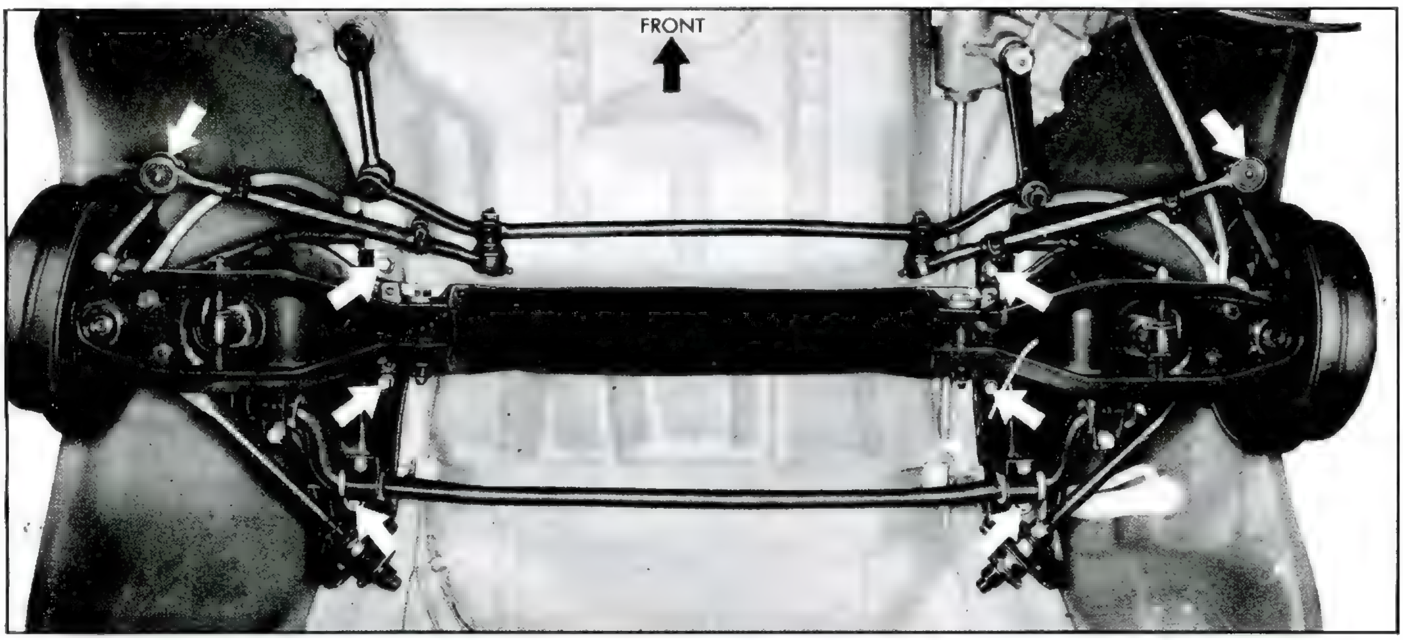


Fig. 3-24—Front Cross Member Attaching Points

FRONT SUSPENSION CROSSMEMBER

This crossmember may be removed as either a complete front suspension system, including wheels and brake assemblies, or after all components have been removed. The basic crossmember removal and installation procedures are the same in either case. Individual item removal and installation (bench overhaul) on a complete front suspension are handled in a similar manner as outlined under the respective headings for each component. One notable exception being spring removal. This may be handled by using large "C" clamps (or other suitable means) for compressing and slowly lessening coil spring tension.

Removal

1. Raise vehicle on hoist (or jack stands) and support so the front suspension will "swing free."
2. Remove both brake pipes from the brake hoses and remove the hoses from the body brackets.
3. Remove the speedometer cable bracket attaching bolts and withdraw cable from spindle.
4. Remove the two cotter keys and nuts that secure the outer ends of the tie rods to the steering arms.
5. Place the front post of a hoist (or other means to allow lowering and raising of crossmember) under the crossmember, and remove the six bolts (three each side) that attach the crossmember to the frame (fig. 3-24). One of the three bolts (per each side) is actually up through the strut rod bracket.

   NOTE: Care and caution must be used to restrain crossmember and see that it does not fall, or slip from its support.

6. Lower crossmember to floor.

Installation

1. Raise crossmember into position. Align the bolt holes with a tapered punch and install the six bolts. Do not tighten any one bolt until all six are in place, or alignment may become difficult. Tighten attaching bolts.
2. Lower post of hoist (if used) or withdraw lifting device.
3. Install the tie rod studs into the steering arm and properly install nuts and cotter keys.
4. Install the brake hoses to the body brackets and install the brake pipes to the hoses. Be certain to bleed the brakes and position the hoses as outlined in Section 5—"Brakes."
5. Install the speedometer cable and attaching bracket.
6. Lower vehicle to floor.

SPECIAL TOOLS

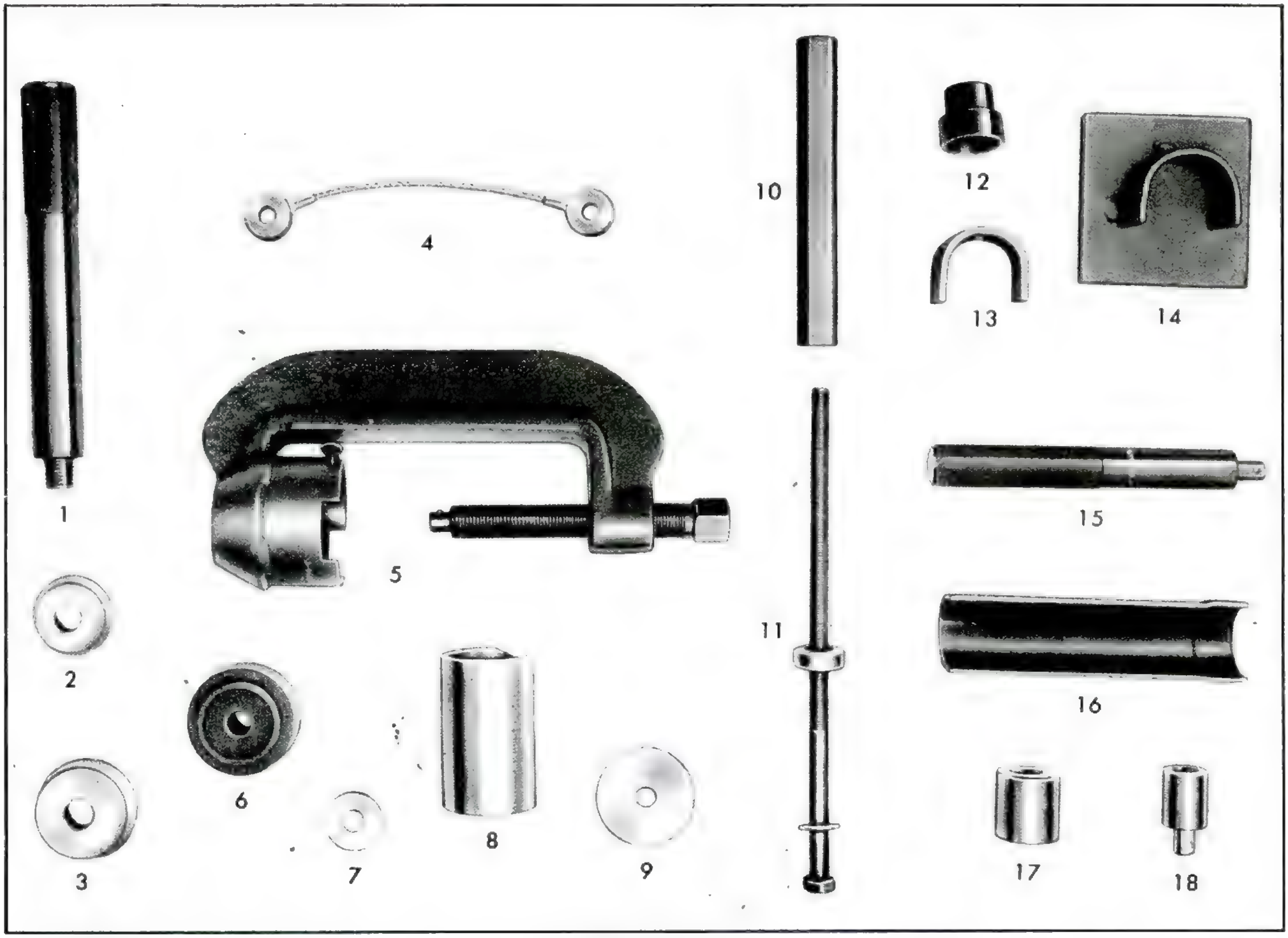


Fig. 3-25—Special Tools

1. J-8092 Driver Handle
2. J-8849 Outer Race Installer
3. J-8850 Inner Race Installer
4. J-4988 Cable
5. J-9519-10 Ball Joint Remover
6. J-9519-16 Ball Joint Installer
7. J-21058-5 Bridge for J-21876-1
8. J-21058-6 Receiver
9. J-21058-7 Bridge for J-21058-6
10. J-21058-8 Puller Screw Nut
11. J-21058-15 Puller Screw
12. J-21876-1 Lower Control Arm Bushing Remover and Installer
13. J-21876-2 Lower Control Arm Spacer
14. J-5888-3 Support
15. J-7079-2 Driver Handle
16. J-8345-1 Upper Control Arm Spacer
17. J-8345-2 Upper Control Arm Bushing Installer
18. J-8345-3 Upper Control Arm Bushing Remover

SECTION 4
REAR AXLE AND REAR SUSPENSION

CONTENTS OF THIS SECTION

REAR AXLE

INDEX

GENERAL DESCRIPTION

The rear axle is of the straddle mounted hypoid gear type which embodies a differential carrier mounted rigidly to the engine; no rear axle housing is used (figs. 1 and 2). Independently suspended drive shafts are attached by universal joints at the wheel drive spindle flange and at the differential side gear yoke.

A hollow shaft is used with the drive pinion to permit passage of the engine output shaft forward to the transmission. To permit the axial hole in the pinion shaft, the drive pinion and gear are two pieces coupled by a shrink fit. The pinion gear and shaft are serviced only as an assembly. The drive pinion shaft is directly connected to the transmission output member. Preloaded tapered roller bearings support the drive pinion at fore and aft locations in the differential carrier. The hypoid ring gear is bolted to the differential case which is mounted by preloaded tapered roller bearings on each side of the differential carrier.

Components of the differential assembly are conventional with the exception of the side gears which have integral elongated splined hubs which project to the outboard extremity of the differential case and cover to receive the axle shaft universal joints.

Rear axle assemblies used with three or four speed transmissions and those used with automatic transmissions have fundamental differences in lubrication, drive pinion design, and mounting hub provisions for the clutch release bearing or converter stator, respectively.

Drive pinion design for the two rear axle assemblies varies mostly in overall length, splining for adaptation to the transmission and sealing. The manual transmission axle pinion shaft extends forward only to the pinion bearing adjusting sleeve and is internally splined to receive the transmission output shaft. On automatic transmission versions, the pinion shaft extends forward beyond

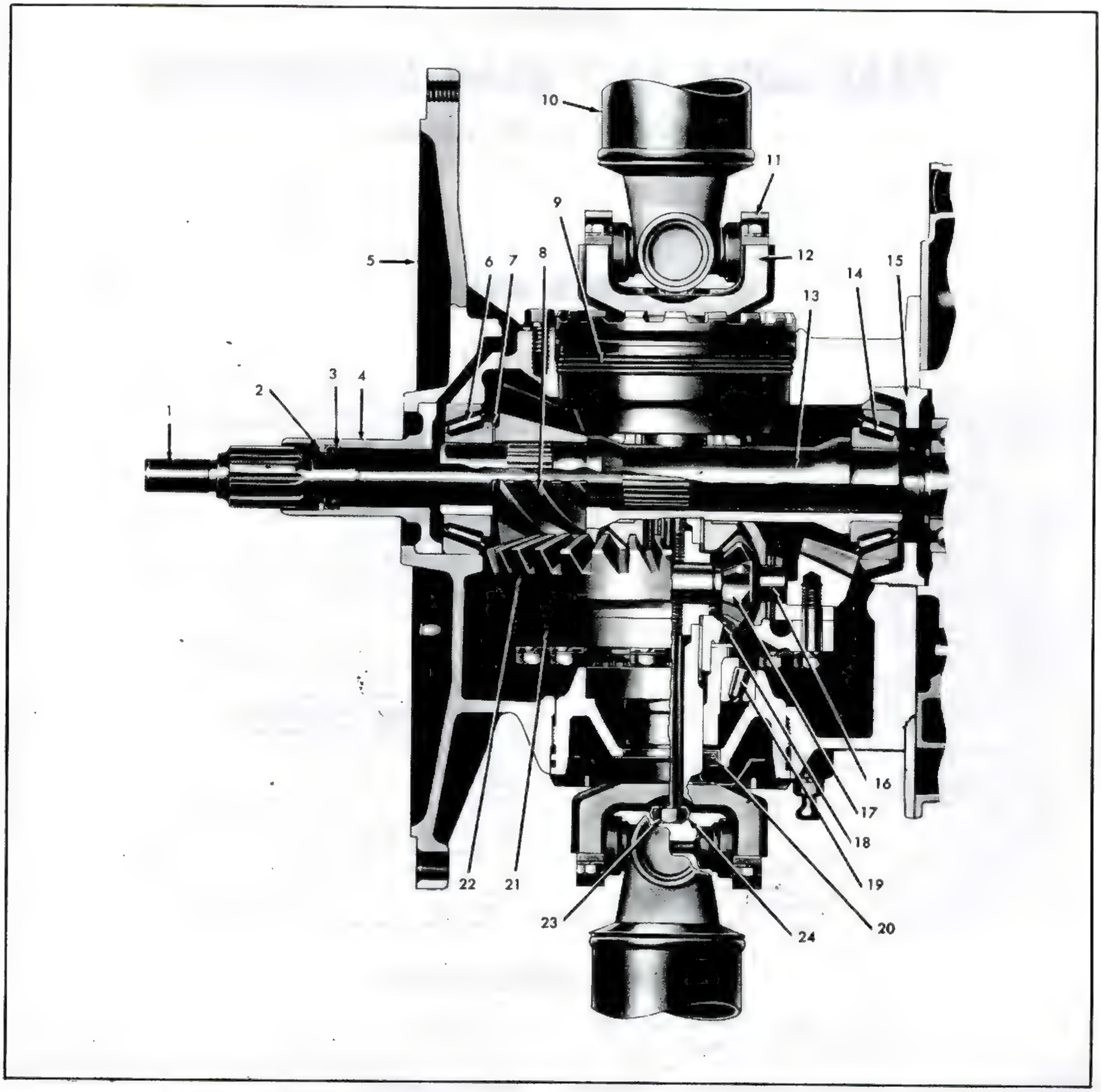


Fig. 1—Manual Transmission Rear Axle

1. Clutch Shaft (Transmission Input)
2. Washer
3. Clutch Shaft Seal
4. Clutch Release Bearing Support
5. Differential Carrier
6. Pinion Rear Bearing and Race
7. Pinion Depth Shim
8. Pinion Gear
9. Differential Side Bearing Adjusting Sleeve
10. Axle Shaft
11. Drive Shaft Trunnion Retaining Strap
12. Differential Side Gear Yoke
13. Pinion Shaft
14. Pinion Front Bearing and Race
15. Pinion Bearing Adjusting Sleeve
16. Differential Pinion Gear Shaft
17. Differential Pinion Gear
18. Differential Side Gear
19. Differential Side Bearing and Race
20. Differential Side Bearing Adjusting Sleeve Seal
21. Differential Cover
22. Ring Gear
23. Differential Side Gear Yoke Retaining Bolt
24. Yoke Retaining Bolt Lock

the pinion bearing adjusting sleeve and is externally splined to index with the transmission planetary carrier. A seal is mounted in the pinion bearing adjusting sleeve to prevent lubricant from transferring between the rear axle and automatic transmission.

Because of its location between the engine and transmission, the rear axle provides mounting elements usually incorporated on the transmission in conventional

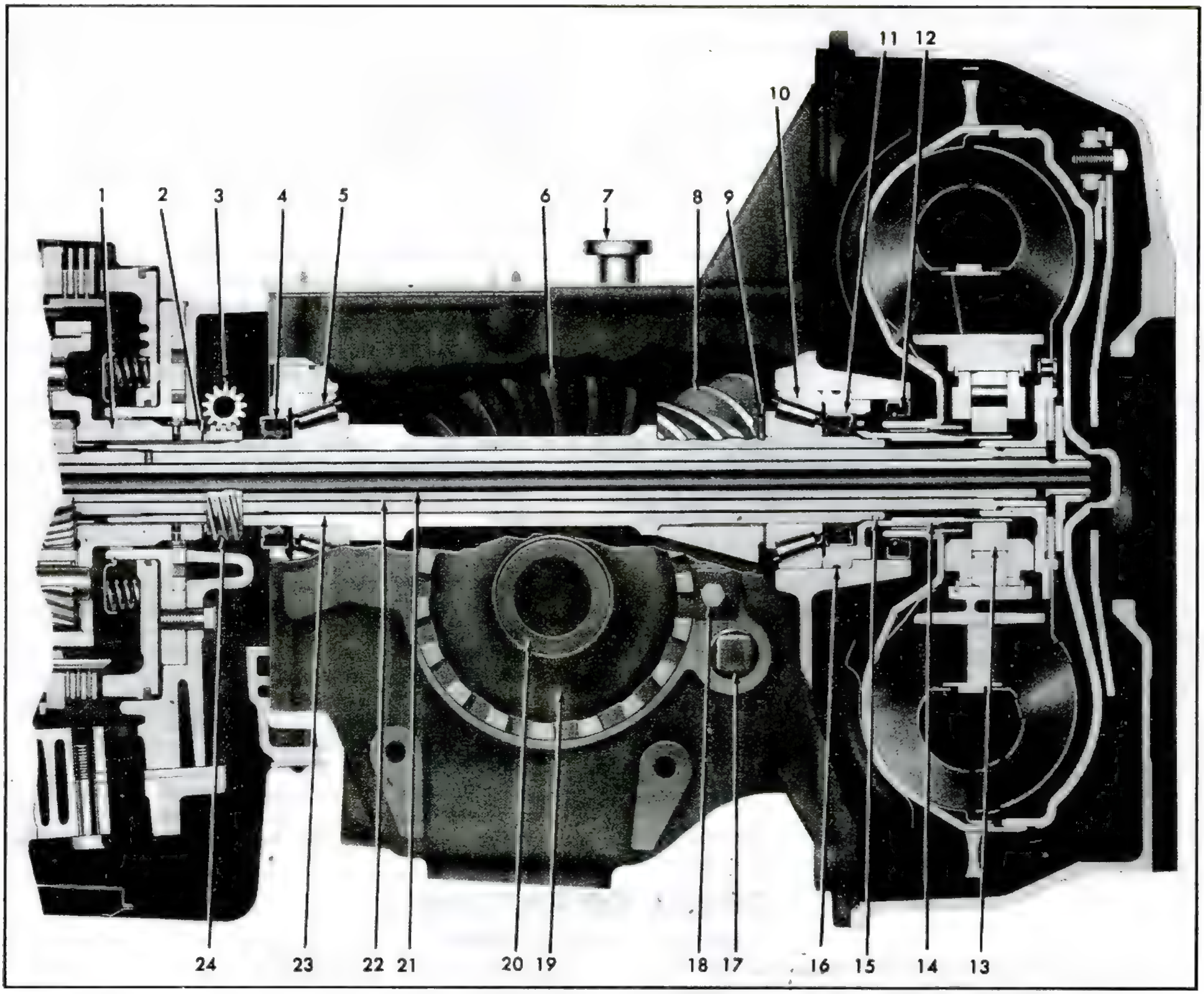


Fig. 2—Automatic Transmission Rear Axle

1. Planet Carrier Hub (Transmission Output)
2. Rear Selective End Play Spacers
3. Governor Driven Gear
4. Pinion Shaft Seal
5. Pinion Front Bearing and Race
6. Ring Gear
7. Vent
8. Pinion Gear
9. Selective Pinion Depth Shim
10. Pinion Rear Bearing and Race
11. Pinion Shaft Rear Seal
12. Stator Hub Seal
13. Stator Assembly
14. Stator Shaft
15. Pinion Shaft Seal Ring
16. Stator Shaft "O" Ring Seal
17. Differential Carrier Filler Plug
18. Side Bearing Adjusting Sleeve Lock Tab
19. Side Bearing Adjusting Sleeve
20. Side Bearing Adjusting Sleeve Seal
21. Transmission Front Pump Shaft
22. Transmission Turbine Shaft
23. Pinion Shaft
24. Governor Drive Gear

designs. On manual transmission models, the rear of the differential carrier mounts the shaft for the clutch release bearing whereas a stator shaft for the converter is carried by the automatic transmission rear axle. The clutch release bearing shaft has a lip seal in the inner diameter to prevent lubricant from flowing rearward onto the clutch. The stator shaft is externally splined and lip-type seals are used at the contact of the pinion shaft and the inside diameter of the stator shaft to prevent transfer of lubricants. A converter hub seal is mounted in the differential carrier adjacent to the stator shaft to prevent loss of automatic transmission fluid. The stator shaft uses an "O" ring seal at its mating surface with the differential carrier.

MAINTENANCE AND ADJUSTMENTS

Periodic maintenance and adjustments are not required for the rear axle. However, the differential case should be checked for lubricant leaks and other visual defects. Lubricant leaks should be checked for at the differential side gear adjusting sleeve seals, filler plug and at the carrier cover. Correction of these leaks consists of replacing the defective seals or gaskets involved as described in this section.

Refer to the lubrication section of this manual for lubricant recommendations and inspection intervals

REAR AXLE NOISE DIAGNOSIS

Mechanical failures of the rear axle are relatively simple to locate and correct. Noise in a rear axle is a little more difficult to diagnose and repair. One of the most essential parts of rear axle service is proper diagnosis.

One of the cardinal points of axle noise diagnosis is the fact that all rear axles are noisy to a certain degree. The action of transmitting the high engine torque through a 90° turn and reducing propeller shaft speed produces noise in rear axles. This point establishes the need for a line between normal and abnormal or unacceptable axle noises.

Slight axle noise heard only at a certain speed or under remote conditions must be considered normal. Axle noise tends to "peak" at varying speeds and the noise is in no way indicative of trouble in the axle.

If noise is present in an objectionable form, loud or at all speeds, an effort should be made to isolate the noise as being in one particular unit of the vehicle. Axle noise is often confused with other noises such as tire noise, transmission noise, engine noise, and universal joint noise. Isolation of the noise as in any one unit requires skill and experience. An attempt to eliminate a slight noise may baffle even the best of diagnosticians. Such practices as raising tire pressure to eliminate tire noise, listening for the noise at varying speeds and on drive, float and coast, and under proper highway conditions, turning the steering wheel from left to right to detect wheel bearing noise, will aid even the beginner in detecting alleged axle noises. Axle noises fall into two categories, gear noise and bearing noise.

Gear Noise

Abnormal gear noise can be recognized since it produces a cycling pitch and will be very pronounced in the speed range at which it occurs, appearing under either "drive," "float" or "coast" conditions. Gear noise tends to peak in a narrow speed range or ranges, while bearing noise will tend to remain constant in pitch. Abnormal gear noise is rare and usually originates from the scoring of the ring gear and pinion teeth as a result of insufficient or improper lubricant in new assemblies. Side gears rarely give trouble as they are used only when the rear wheels travel at different speeds.

Bearing Noise

Defective bearings will always produce a rough whine that is constant in pitch and usually most noticeable under "drive" conditions. This fact will allow you to distinguish between bearing noise and gear noise.

1. Pinion bearing noise resulting from a bearing failure can be identified by a constant rough sound. Pinion bearings are rotating at a higher speed than differential side bearings or wheel bearings. This particular noise can be picked up best by testing the car on a smooth road (black top). However, care should be taken not to confuse tire noise with bearing or gear noise. If any doubt exists, tire treads should be examined for irregularities that would produce such noise.
2. Wheel bearing noise may be confused with rear axle noise. To differentiate between wheel bearings and rear axle, drive the vehicle on a smooth road at medium-low speed. With traffic permitting, turn the vehicle sharply right and left. If noise is caused by wheel bearings, it will increase in the turns because of the side loading. If noise cannot be isolated to front or rear wheel bearings, inspection will be necessary.
3. Side bearings will produce a constant rough noise of a slower nature than pinion bearings. Side bearing noise will not fluctuate in the above wheel bearing test.

SERVICE OPERATIONS

SERVICE REFERENCE GUIDE

Prior to starting any operation on the rear axle, check the following "Service Reference Guide" to prevent unnecessary removal of the power train from the vehicle.

The components marked DIFFERENTIAL CARRIER IN VEHICLE can be serviced with the rear axle main component, the differential carrier, in its installed position. Operations labeled DIFFERENTIAL CARRIER REMOVED FROM VEHICLE require that the power train (engine-axle-transmission) be removed from the vehicle, the transmission and axle removed from the engine, and then finally that the differential carrier be separated from the transmission in order for the repair operations to be performed.

Complete instructions for the removal and installation of the power train are carried in Section 6.

DIFFERENTIAL CARRIER IN VEHICLE

- Drive Shaft and Universal Joints
- Differential Side Bearing Yoke
- Differential Side Bearing Adjusting Sleeve Seal

DIFFERENTIAL CARRIER REMOVED FROM VEHICLE

Service operations relative to all components not listed under DIFFERENTIAL CARRIER IN VEHICLE require the removal of the power train and separation of the differential carrier to perform.

Drive Shaft and Universal Joints

Removal

1. Raise vehicle and support with stand jacks at jacking pads on underbody.
2. Position hydraulic jack under torque arm or rear strut rod torque arm bracket and raise jack until drive shaft is at or near curb position.
3. Disconnect inboard drive shaft trunnion from side gear yoke by removing the four bolts and retaining straps (fig. 3).
4. Remove the four bolts and retaining straps securing outboard drive shaft trunnion to drive spindle flange.
5. Pry drive shaft out of flange or yoke and remove shaft from vehicle.

Repairs

NOTE: The universal joints are of the lube-for-life design and do not require periodic inspection or lubrication; however, when these joints are disassembled, repack bearings with a high-melting-point wheel bearing lubricant and replace the dust seals.

1. Remove bearing lock rings from trunnion yoke.
2. Support trunnion yoke on a piece of 1-1/4" I.D. pipe (or a suitable socket) on an arbor press (fig. 4).

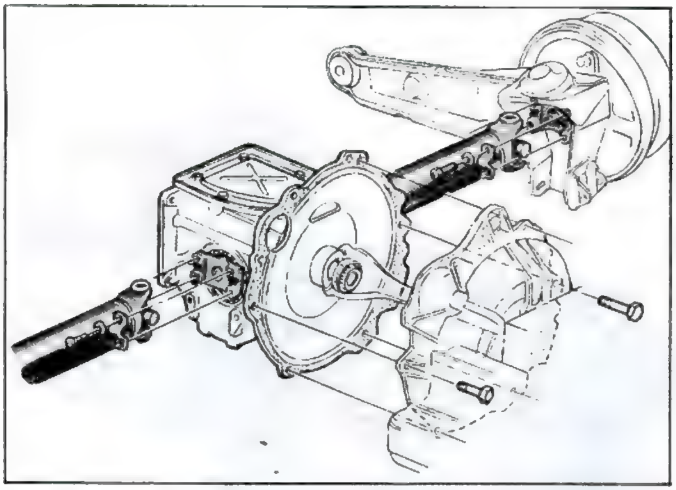


Fig. 3—Axle Drive Shaft Installation

NOTE: It may be more convenient to use a bench vise, for removal and installation, instead of an arbor press. If this is the case, proceed with disassembly and assembly procedure as with an arbor press.

3. Using a suitable socket or rod, press trunnion down far enough to drive bearing cup from yoke.
4. Remove dust seals from trunnion fingers, clean and inspect bearing rollers and trunnion. Relubricate bearings with a high-melting-point wheel bearing lubricant.
5. Place new dust seals on trunnion finger—cavity of seal toward end of trunnion—then position Tool J-21548 over end of trunnion and into cavity portion of seal. Press seal onto trunnion until tool bottoms against trunnion finger (fig. 5).

NOTE: Installation of seal is critical to proper sealing—use specified tool during seal installation to prevent seal distortion and to assure proper seating of seal on trunnion.

6. Partially install one bearing cup into yoke. Place trunnion in yoke and into bearing cup. Install other bearing cup and press both bearing cups into yoke, being careful to keep trunnion aligned in bearing cups.

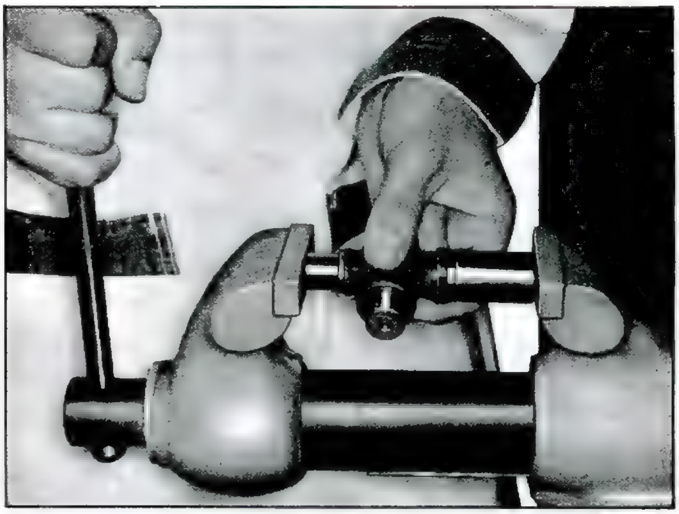


Fig. 5—"U" Joint Trunnion Seal Installation

7. Press bearing cups into trunnion to permit lock ring installation—install lock rings.

Installation

1. Place drive shaft trunnion into side gear yoke and partially install the four retaining bolts and straps.
2. Position outboard end of drive shaft into the drive spindle flange and partially install the four retaining bolts and straps.
3. Rotate drive shaft so that loose ends of trunnion are in a horizontal position, then tighten retaining bolts alternately until both ends of the drive shaft are seated in the trunnion seats. Torque bolts to specifications and recheck for proper seating.
4. Remove hydraulic jack from its position under the torque arm or strut bracket.
5. Remove stand jacks and lower vehicle to floor.

Differential Side Bearing Yoke

Replacement

1. Remove drive shaft as outlined previously in this section.

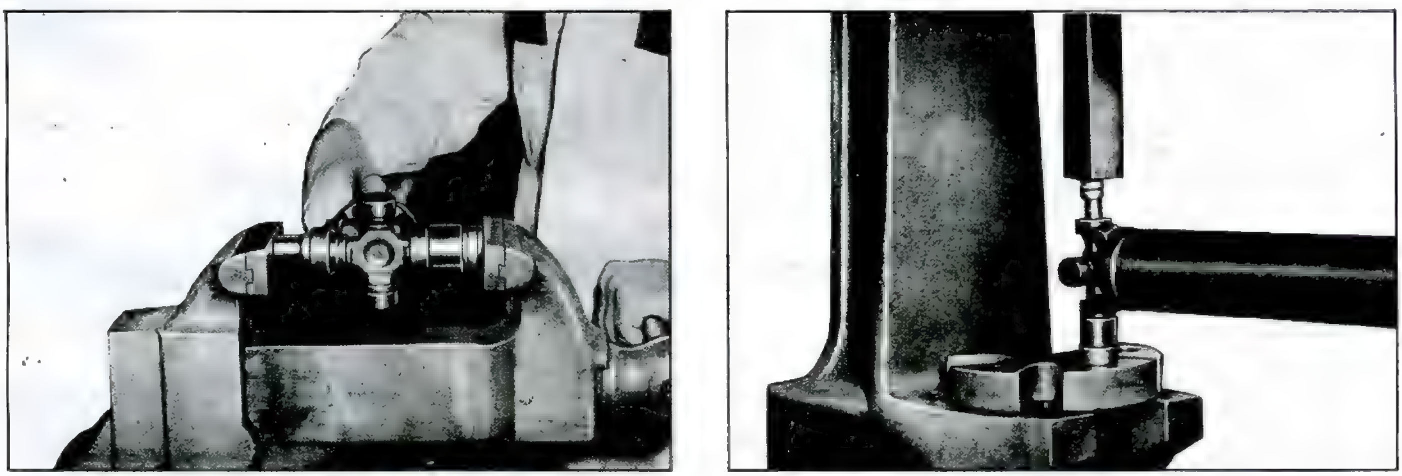


Fig. 4—Removing Bearing Caps

2. Using a hammer and chisel or other suitable tools, bend the yoke bolt locking tabs so that bolt may be removed.
3. Remove the yoke retaining bolt and withdraw yoke from side gear.
4. Position yoke in side gear and install yoke retaining bolt and bolt lock.
5. Torque yoke retaining bolt to specifications and bend all locking tabs against side of bolt head.
6. Install drive shaft as outlined previously in this section.

Side Bearing Adusting Sleeve Seal

Replacement

1. Remove drive shaft and differential side bearing yoke as outlined previously in this section.
2. Pry out the old seal, using care not to damage adjusting sleeve seal surface.
3. Place new seal in bore so that seal lips are inward, then using a suitable flat object as a driver, install the seal so that it is flush with the adjusting sleeve surface.
4. Install differential side bearing yoke and drive shaft as outlined previously in this section.

DIFFERENTIAL CARRIER—REMOVAL AND INSTALLATION FROM VEHICLE

For removal and installation procedures for the differential carrier refer to Section 6.

DIFFERENTIAL CARRIER REMOVED FROM VEHICLE

Separation of Three or Four Speed Transmission and Differential Carrier

To separate the three or four speed transmission from the differential carrier, simply remove the four attaching bolts. Two bolts are driven from the transmission on the right side and the two left bolts are driven from the carrier side.

Assembly of Three or Four Speed Transmission and Differential Carrier

1. Apply a new gasket to either the mounting face of the transmission or carrier with petroleum jelly.
2. Couple the transmission to the carrier, being sure to engage the splines of the transmission mainshaft to the internal splines of the pinion in the differential carrier.
3. Secure the transmission to the carrier with four bolts; two on the right are driven from the transmission side and the two left bolts are driven from the carrier side. Torque bolts to specifications.

Separation of Automatic (Powerglide) Transmission and Differential Carrier

1. Place the Transaxle on a flat surface.
2. Pull the turbine shaft carefully through the transmission and carrier being careful not to damage the turbine shaft bushings on the pump shaft splines.
3. Remove the screw securing the governor assembly to the Transaxle and remove governor (fig. 6).
4. Remove the three remaining bolts securing the transmission to the carrier, then carefully pull the transmission straight away from the carrier to prevent the pump shaft from damaging the bushings in the transmission and pinion shaft.

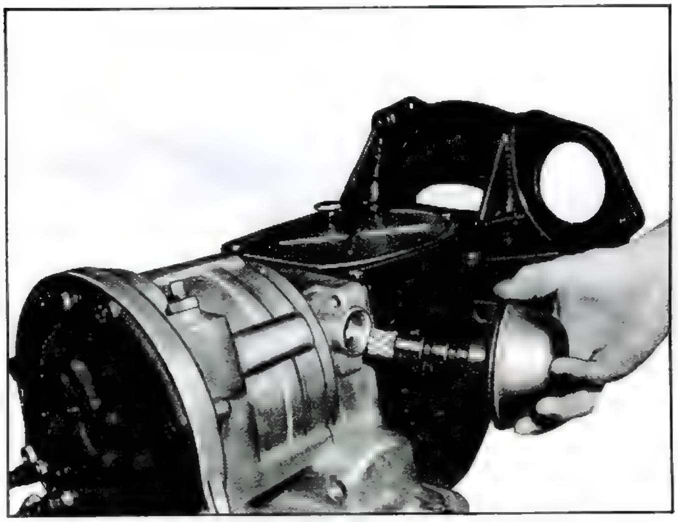


Fig. 6—Removing Governor

5. Remove transmission to differential carrier gasket and remove the governor gear and selective spacers from the pinion shaft of the differential carrier (fig. 7).

Assembly of Automatic (Powerglide) Transmission to Differential Carrier

1. Prior to reassembly of the differential carrier to the Powerglide transmission after any repair which required separation of these units, perform the procedure outlined below to determine the thrust washers required at the front face of the governor gear.

CAUTION: Be sure low band is properly adjusted to prevent disengagement or cocking apply linkage before tipping transmission on end.

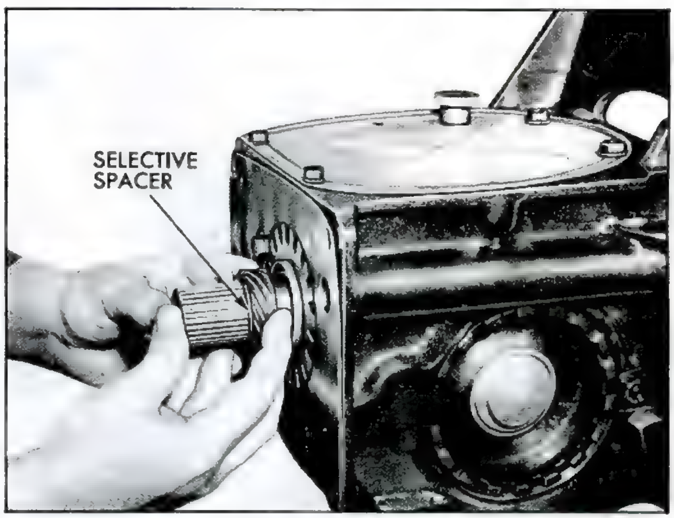


Fig. 7—Removing Governor Drive Gear and Spacers

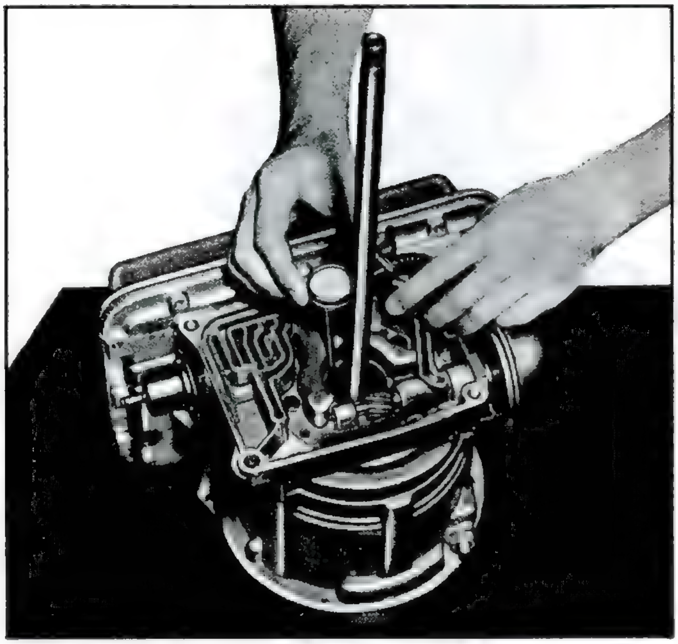


Fig. 8—Zeroing Dial Indicator on J-8364 on Output Shaft

Rear Selective Thrust Washer Determination:

Strict adherence to the procedure outlined below is mandatory to insure Powerglide internal running clearance of .025"—.045". If transmission is assembled with less clearance, transmission failure is probable.

a. Install dial indicator on Support J-8364 and install 3" indicator extension provided.
b. Without gasket, place support on rear pump cavity surface of the transmission case with transmission on front end as illustrated (fig. 8) so that dial indicator tip rests on planet carrier hub. Adjust indicator on J-8364 as required to permit maximum indicator travel and set indicator dial to zero.

NOTE: Front end of transmission must face downward when indicator is zeroed.

c. Slowly lift Support J-8364 and indicator off transmission rear pump cavity and note its range of needle deflection from zero position. Properly positioned on support, indicator should not deflect more than .050" (one-half turn) when removed; otherwise raise or lower dial indicator on support post as required and again zero gauge as described in Step b.
d. Place J-8364 and dial indicator on governor gear on the differential carrier pinion shaft as illustrated (fig. 9) and lower support slowly so that revolutions of indicator needle can be counted. Measurement starts once the indicator needle again reaches zero. Fully depress support on governor gear, note indicator reading and refer to the following chart for spacers to be installed on governor gear.

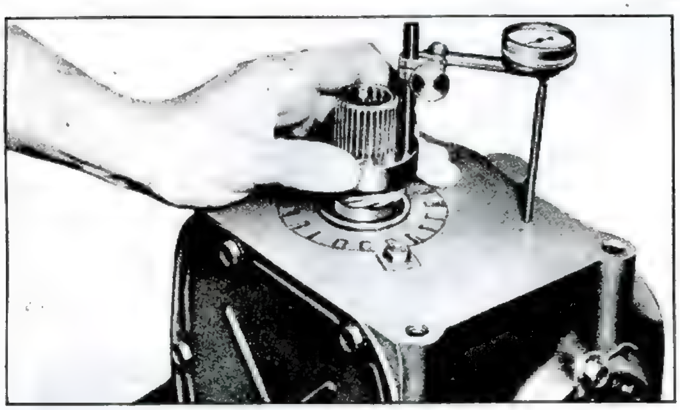


Fig. 9—Mounting Difference with J-8364 and Dial Indicator

POWERGLIDE REAR THRUST SPACER USAGE CHART

Indicator Reading	Number .016" Spacers Req'd.	Thickness of Spacers Installed
*.025—.046	None	
.047—.062	1	.016 ± .001
.063—.078	2	.032 ± .002
.079—.094	3	.048 ± .003
.095—.110	4	.064 ± .004
.111—.126	5	.080 ± .005
.127—.142	6	.096 ± .006
.143—.155	7	.112 ± .007

*If initial indicator reading is below .025", replace thrust washer at the clutch hub—front pump with .050" thrust washer, then repeat entire rear thrust spacer selection procedure.

e. Install spacers selected on governor gear (fig. 10), then check that proper total thickness has been installed by again measuring with J-8364 as described in Step d. If shim stack is correct, indicator reading will now be between .025"—.045"; otherwise add or remove spacers until reading is within this range.

2. Apply a new gasket to either the carrier or the rear face of the transmission with petroleum jelly.

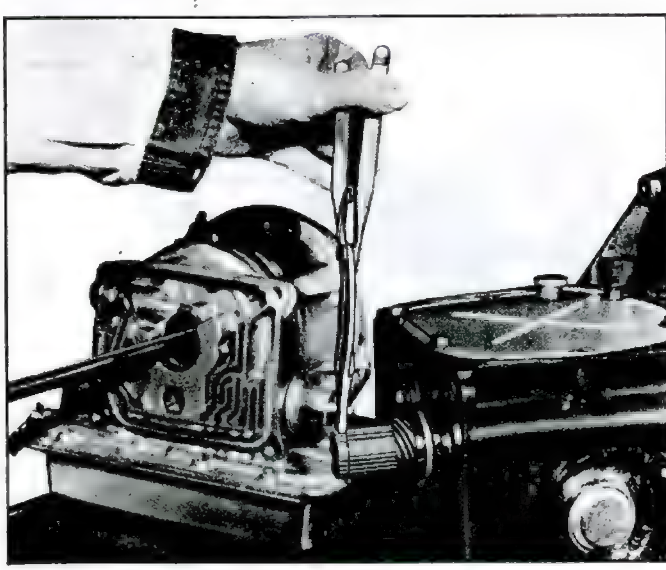


Fig. 10—Installing Rear Selective Spacer

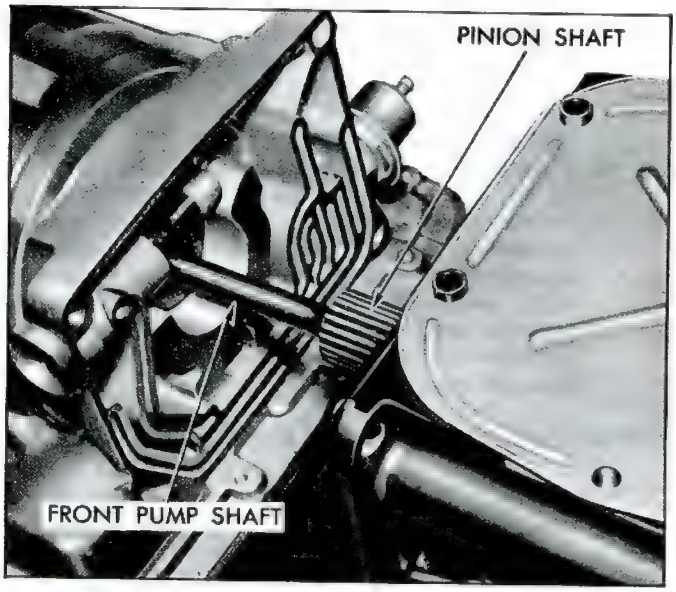


Fig. 11—Engaging Pinion Shaft-to-Transmission Planet Carrier Splines

3. Align the carrier and transmission on a flat surface and carefully guide the pump shaft through the differential carrier so as not to damage the bushing in the pinion. Then engage the splines of the pinion shaft with the planet carrier internal splines in the transmission (fig. 11).
4. Install governor, then secure the transmission to the carrier with four bolts. Drive the two bolts from the carrier side first to minimize the chance of cocking the mating surfaces of the transmission and carrier. Tighten bolts to specifications.
5. Install the turbine shaft being careful not to damage its bushings as it is inserted over the pump shaft splines. Be sure to engage the two sets of shaft splines; the forward splines engage the clutch drum and the rear set engage the input sun gear in the planet gearset.
6. Install the converter, being sure to get full engagement of the splines on the stator shaft, turbine shaft,

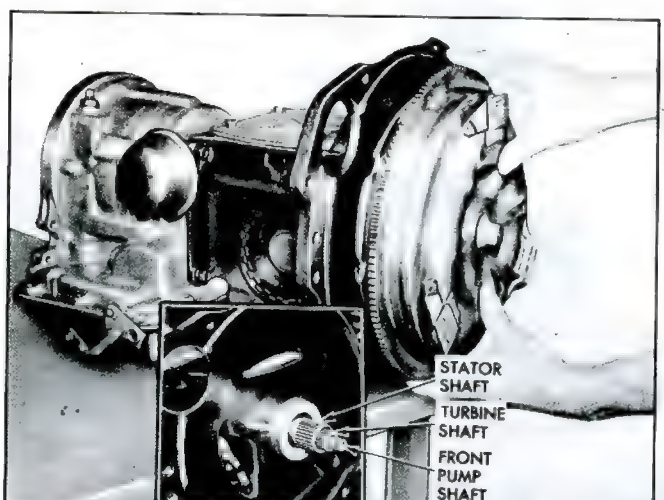


Fig. 12—Installing Converter on Transaxle

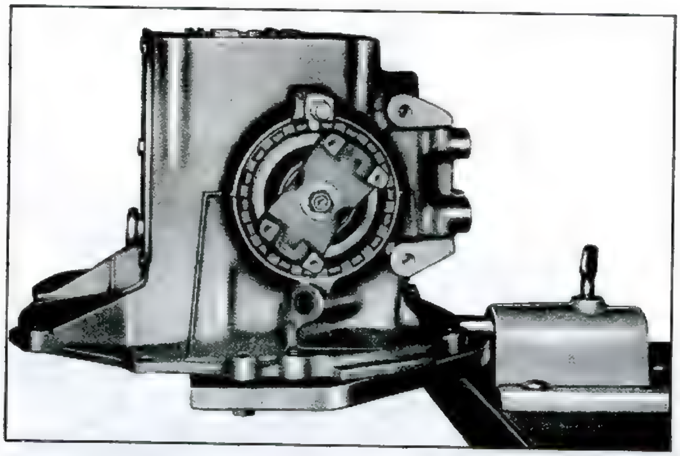


Fig. 13—Differential Carrier in J-3289-01 Fixture

and front pump shaft with the applicable converter splines (fig. 12).

CAUTION: Once the converter is installed, do not tip rear of Transaxle downward unless some improvised converter holding plates are used as the converter will fall off.

Differential Carrier

Disassembly

1. Drain the differential carrier by removing the filler plug or the cover.
2. Mount differential carrier in Holding Fixture J-3289-01 as illustrated in Figure 13.
3. Remove six bolts and external tooth lock washers attaching the cover to the differential carrier. Remove cover and gasket.
4. Bend locking tabs on side gear yoke retaining bolt and remove both side gear yokes.
5. Remove cap screw securing locking tab to differential side gear adjusting sleeves and then remove adjusting sleeve using J-8342 (fig. 14).
6. To remove pinion adjusting sleeve, first remove locking tab and then unscrew the adjusting sleeve using J-972 as illustrated (fig. 15).
7. Remove pinion drive gear with bearings attached by lifting upward and then removing through the cover hole (fig. 16).

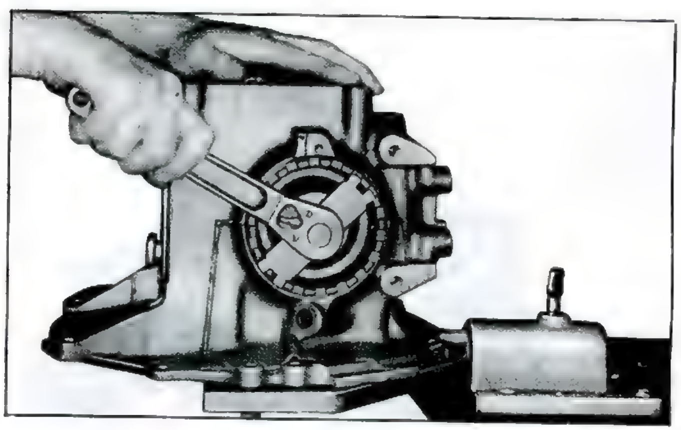


Fig. 14—Removing Side Bearing Adjusting Sleeve with J-8342

8. Remove differential assembly from carrier by shifting differential to one side of carrier and then turning 90° in order to remove via the cover hole in the carrier. This completes usual disassembly operations.

Inspection

Refer to Figure 17.

1. Inspect all bearing cups, races and rollers for scoring, chipping or evidence of excessive wear. Inspect large end of rollers for wear. This is where wear is most evident on taper roller bearings.

   NOTE: The rear axle pinion bearings are of the preloaded type, and the natural wear pattern is a frosted condition with occasional slight scratches on races or rollers. This does not indicate a defective bearing.

2. On automatic transmission axles, inspect oil seal in stator support and at converter hub for evidence of wear or damage.
3. Inspect pinion splines (internal or external) for evidence of excessive wear.
4. Inspect ring gear and pinion teeth for scoring, cracking or chipping.
5. Check fit of side gear and "U" joint shaft splines.
6. Inspect differential carrier for cracks or crossed threads.

Manual and Automatic Transmission Axles

Repairs

The following repair operations apply to both manual and automatic transmission differential carriers.

Those repairs to components peculiar only to the manual transmission carrier or automatic transmission carrier follow.

Pinion and/or Bearing Replacement Including Pinion Depth Shim Determination

If for any reason it is necessary to replace pinion bearings and/or the ring gear and pinion, it is necessary to re-establish the pinion mounting distance as described herein.

1. To remove the pinion front and rear bearings place the pinion in a press and using J-8331 Puller Plate

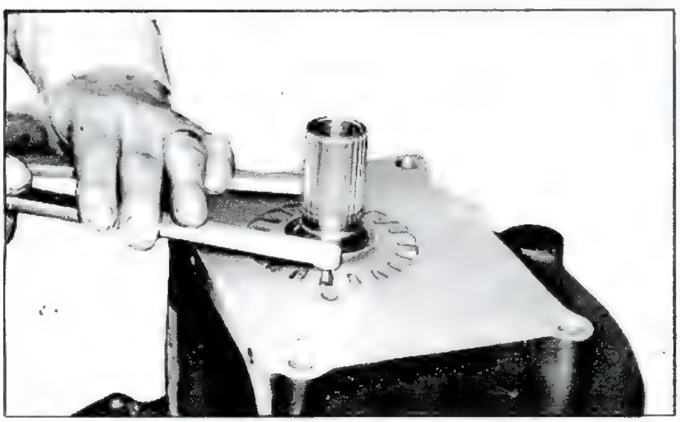


Fig. 15—Removing Pinion Adjusting Sleeve with J-972

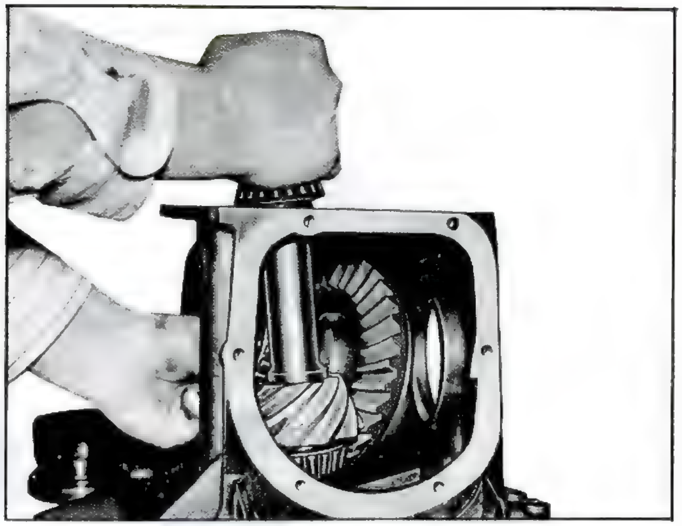


Fig. 16—Removing Pinion from Carrier

in conjunction with J-358-1 Holder, press bearings from pinion (fig. 18). It will be noted that shim(s) are used between the pinion rear bearing and pinion.

2. To determine the shim thickness to be used between pinion rear bearing and pinion gear, proceed as follows:
   a. With the differential carrier mounted as illustrated in Figure 19, place pinion rear bearing to be used in assembly in carrier and rotate several times to be sure the bearing is seated.
   b. Insert Adapter Plug J-6266-25 into bore of stator shaft or clutch bearing shaft, then place Gauge Plate J-6266-5 on rear bearing and insert clamp bolt thru gauge plate and adapter plug holes and lightly tighten nut.

      Holding Adapter Plug J-6266-25, shift gauge plate fore and aft and then side-to-side to "feel" when clamp screw is as nearly perfectly centered in the adapter plug bore as possible.

      When this position is achieved, tighten clamp nut to six ft. lbs.

CAUTION: It is imperative that the gauge plate hole be accurately centered in the rear bearing bore before the clamp nut is tightened, as mispositioning can cause the bearing to cock and invalidate the gauging procedure.

   c. Place Gauge Cylinder Adapter, J-6266-18 in unthreaded portion of side bearing adjusting sleeve bore, and then insert Gauge Cylinder J-6266-01 in adapter with plunger and mounting post horizontal. Oscillate gauge body to insure that the adapter crescents and body are fully seated in the side bearing bores.
   d. Place Gauge J-6266-19 on gauge plate so that it is centered beneath the gauge body. Loosen clamping screw in gauge and slide plunger back and forth slightly so that it is exactly centered between the low point of the gauge cylinder and gauge plate. When this position is obtained, tighten screw in plunger and remove plunger.
   e. Using a 2" micrometer, measure the gauge plunger and record this reading (fig. 20).

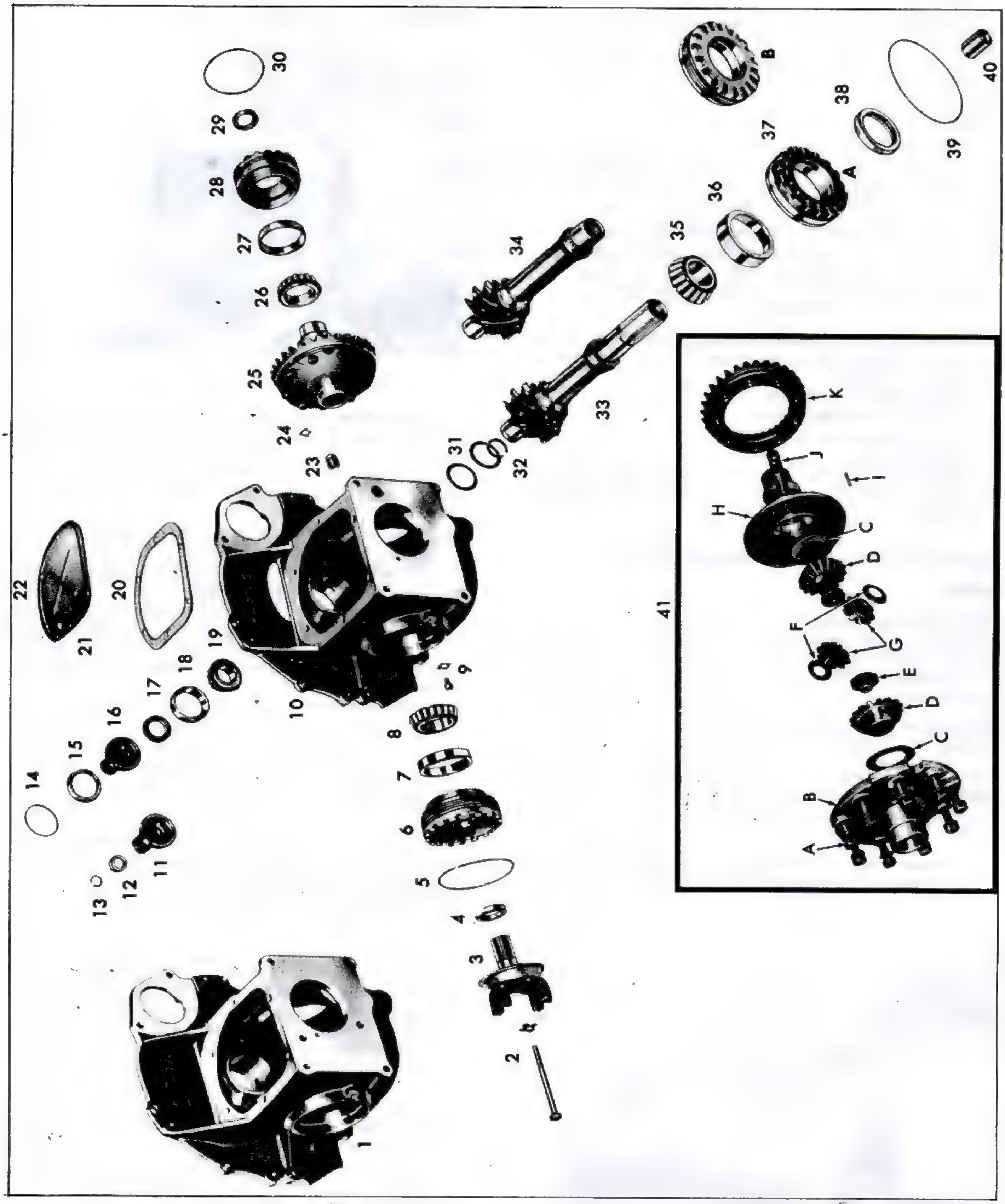


Fig. 17—Differential Carrier—Exploded View

Fig. 17—Differential Carrier—Exploded View

1. Differential Carrier (3-Speed)
2. Yoke Attaching Parts
3. Yoke
4. Side Bearing Adjusting Sleeve Seal
5. Side Bearing Adjusting Sleeve Seal Ring
6. Side Bearing Adjusting Sleeve
7. Side Bearing Race
8. Side Bearing
9. Adjusting Sleeve Lock Tab and Bolt
10. Differential Carrier (Powerglide)
11. Clutch Release Bearing Shaft (3-Speed Only)
12. Clutch Release Bearing Shaft Seal (3-Speed Only)
13. Split Ring (3-Speed Only)
14. Seal Ring
15. Converter Hub Seal (Powerglide Only)
16. Stator Shaft (Powerglide Only)
17. Pinion Rear Seal (Powerglide Only)
18. Pinion Rear Bearing Race
19. Pinion Rear Bearing
20. Cover Gasket
21. Carrier Cover
22. Vent
23. Filler Plug
24. Adjusting Sleeve Lock Tab
25. Differential Assembly
26. Side Bearing
27. Side Bearing Race
28. Side Bearing Adjusting Sleeve
29. Side Bearing Adjusting Sleeve Seal
30. Side Bearing Adjusting Sleeve Seal Ring
31. Selective Pinion Depth Shims
32. Pinion Shaft Seal Ring (Powerglide Only)
33. Pinion (Powerglide Only)
34. Pinion (3-Speed Only)
35. Pinion Front Bearing
36. Pinion Front Bearing Race
37. Pinion Adjusting Sleeve
    A. Powerglide Type
    B. Manual Transmission Type
38. Pinion Front Seal (Powerglide Only)
39. Pinion Adjusting Sleeve Seal Ring
40. Pinion Shaft Bushing (Powerglide Only)
41. Differential Components
    A. Ring Gear Bolts and Lock Washers
    B. Differential Cover
    C. Side Gear Thrust Washers
    D. Side Gears
    E. Yoke Retaining Nut
    F. Pinion Thrust Washers
    G. Pinion Gears
    H. Differential Case
    I. Retaining Pin
    J. Pinion Shaft
    K. Ring Gear

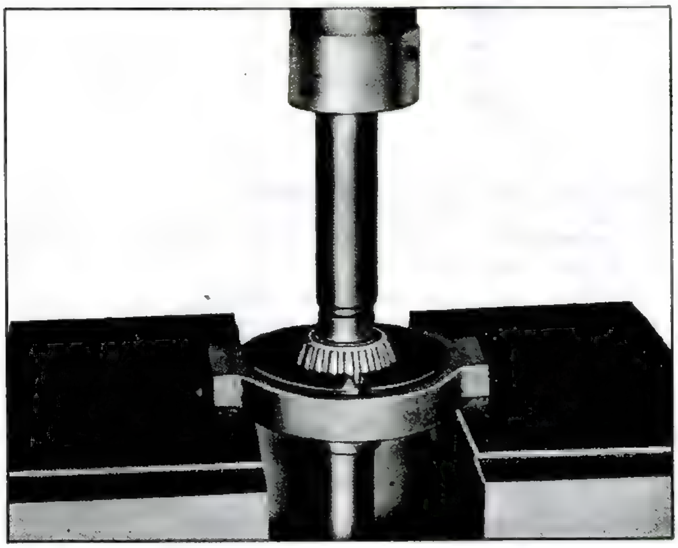


Fig. 18—Removing Pinion Bearing and J-8331 Plates and J-0358-1 Holder

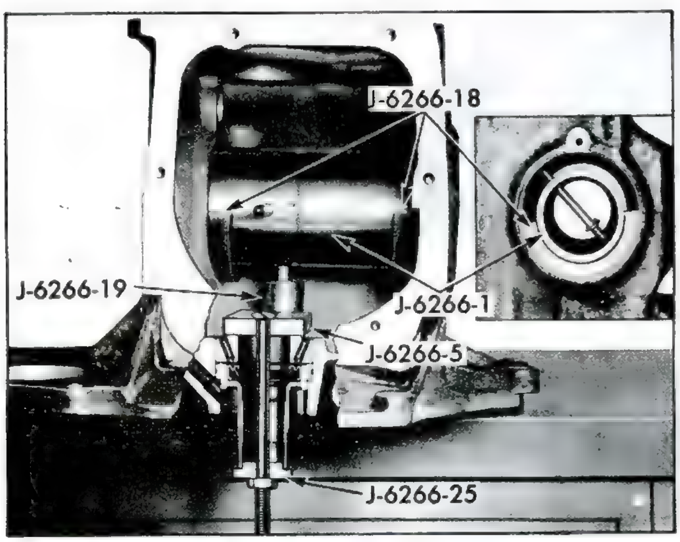


Fig. 19—Pinion Depth Shim Selection Gauge—Installed Views

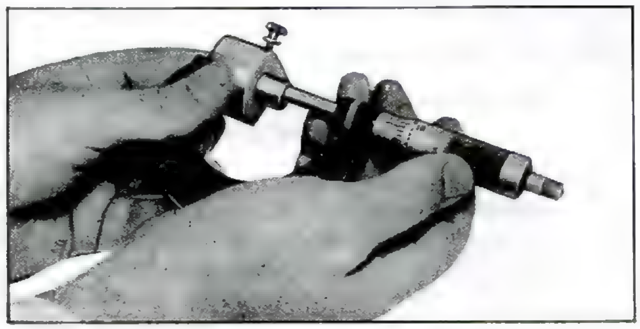


Fig. 20—Measuring Gauge J-6266-19 with Micrometer

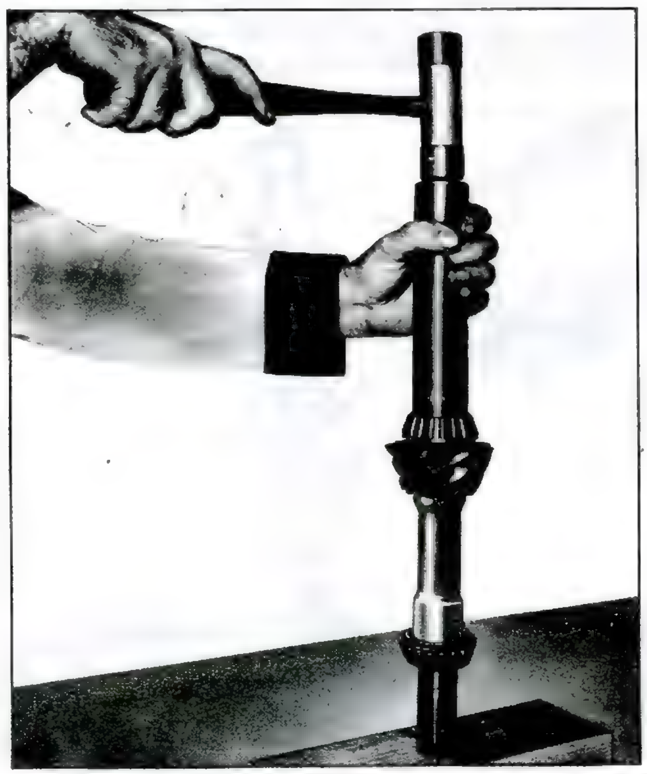


Fig. 21—Installing Pinion Rear Bearing with J-5590

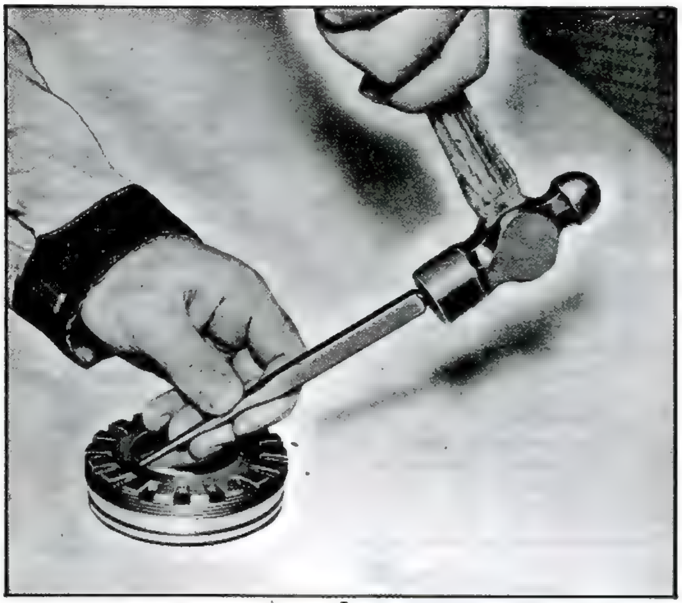


Fig. 22—Removing Pinion Front Bearing Race from Pinion Adjusting Sleeve

f. Refer to the pinion shim usage chart and select a reading corresponding to the micrometer reading obtained in Step e. The number opposite the reading indicates, in thousandths of an inch, the shim thickness required for proper pinion setting. Shims are available in .006" and .009" thicknesses, select shim or combination of shims required for proper thickness.

For example, assume that the gauge reading is 1.255". This indicates that for this particular pinion and gauge indication, one .009" and one .006" shim should be installed between the pinion rear bearing and pinion gear.

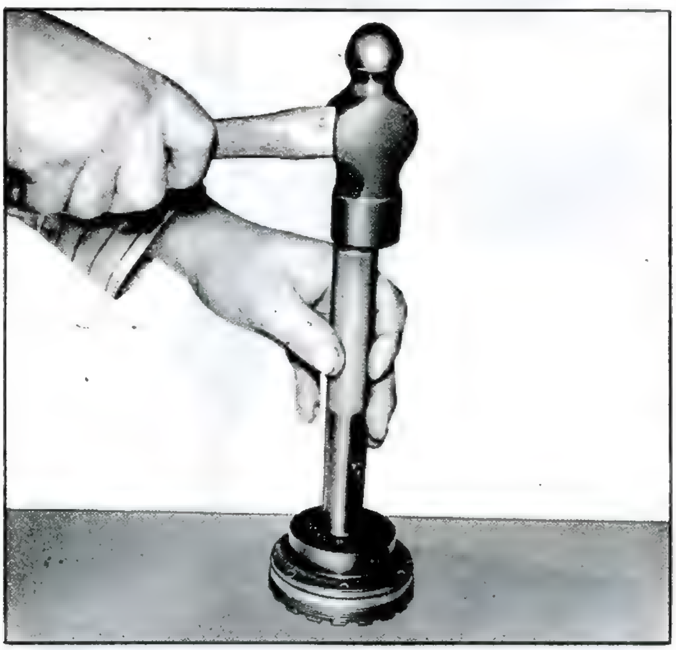


Fig. 23—Installing Bearing Race in Pinion Adjusting Sleeve with J-7137 Driver and J-7079-2 Handle

Accordingly, if the gauge indication was 1.260", the chart lists "21" therefore one .009" shim and two .006" shims should be installed. In the chart, the decimal and zeros usually preceding the thousandths have been omitted.

3. Assemble shim(s) selected in Step 2f on rear face of pinion gear, then install pinion rear bearing using J-5590 as illustrated in Figure 21. Install pinion front bearing in the same manner.

PINION DEPTH SHIM USAGE CHART

Micrometer Reading	Shim Thickness
1.250	9
1.251	12
1.252	12
1.253	12
1.254	15
1.255	15
1.256	15
1.257	18
1.258	18
1.259	18
1.260	21
1.261	21

Pinion Front Bearing Race Replacement

1. Remove old race with a punch as illustrated (fig. 22). On automatic transmission models, it is necessary to remove the seal.
2. Install new race in pinion adjusting sleeve using J-7137 Driver and J-7079-2 Handle (fig. 23).
3. On automatic transmission units, install new seal with J-8340 (fig. 24).

Side Bearing Adjusting Sleeve Seal Replacement

Pry out old seal, then install new seal with lips inward using any flat object as a driver.

Side Bearing Adjusting Sleeve Bearing Race Replacement

1. Punch mark the side bearing adjusting sleeve at two

Fig. 24—Installing Pinion Front Oil Seal—Automatic Transmission Only

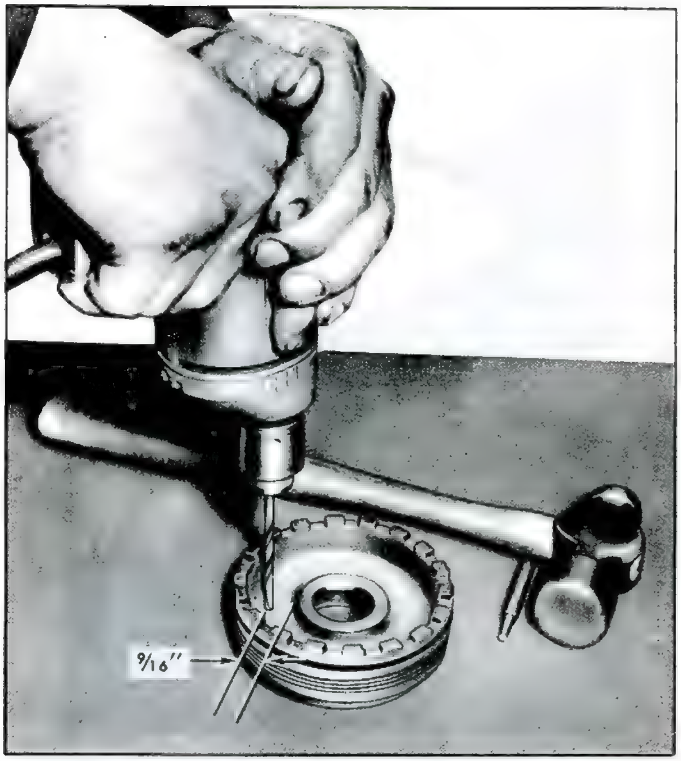


Fig. 25—Drilling Side Bearing Adjusting Sleeve for Race Removal

places 9/16 of an inch outboard from the seal bore 180-degrees apart (fig. 25).

2. Using a 3/16" or smaller drill, drill through the adjusting sleeve at the punch mark locations until the drill is stopped by the bearing race.
3. Drive out the bearing race using a small pin punch as illustrated in Figure 26.
4. Install new bearing race in adjusting sleeve using a suitable flat plate as a driver. Drive bearing race until it is flush.

Fig. 26—Removing Side Bearing Race

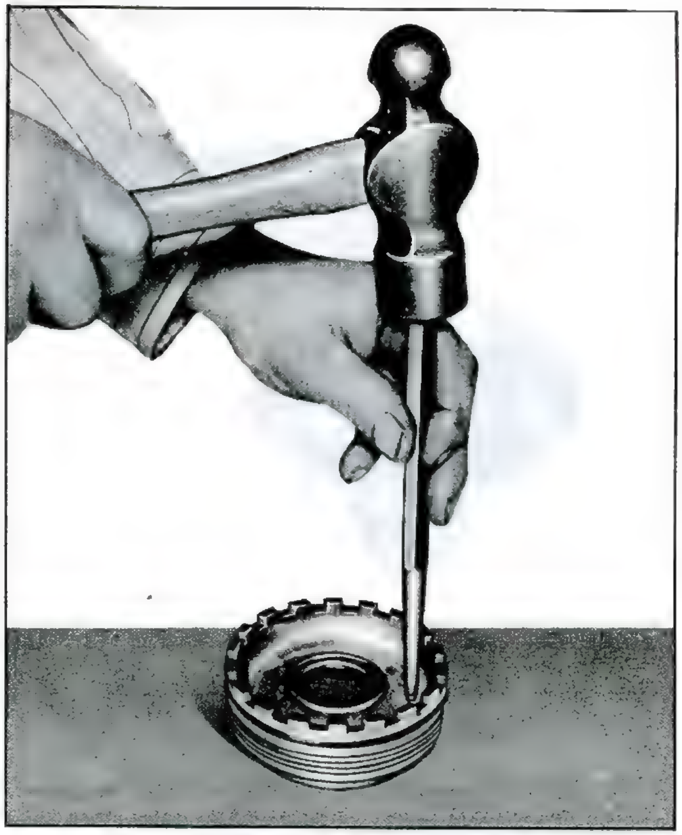


Fig. 27—Sealing Drilled Holes in Adjusting Sleeve with Lead Balls

5. Seal the drilled holes by using lead balls of at least .225" diameter as illustrated (fig. 27). Balls of this type are commercially available for carburetor repair kits.

Ring Gear Replacement, Side Bearing Replacement and Differential Overhaul

Disassembly

1. If replacement is necessary, remove differential side bearing(s) with J-7112 Puller and J-8107-2 Pilot as shown (fig. 28).

   NOTE: Bearing and bearing race should be replaced as set only.

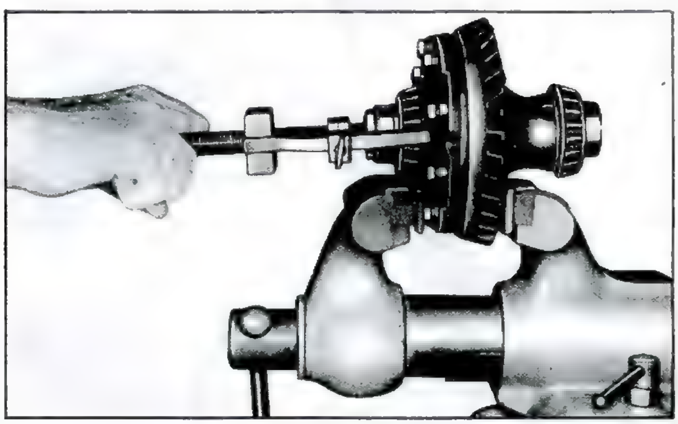


Fig. 28—Removing Differential Side Bearings

Fig. 29—Removing Side Gear

2. Remove bolts and lock washers securing ring gear and differential cover to differential case, then remove cover, side gear, "U" joint yoke nut (fig. 29), and side gear thrust washer.
3. To remove ring gear from differential case, tap edges of ring gear with a soft hammer. If only ring gear replacement is required no further disassembly is needed.
4. To remove the differential pinions, drive out the roll pin securing the differential pinion shaft to the differential case (fig. 30). Then tap pinion shaft out of case and remove pinion gears, thrust washer and "U" joint yoke nut to complete disassembly of differential assembly.

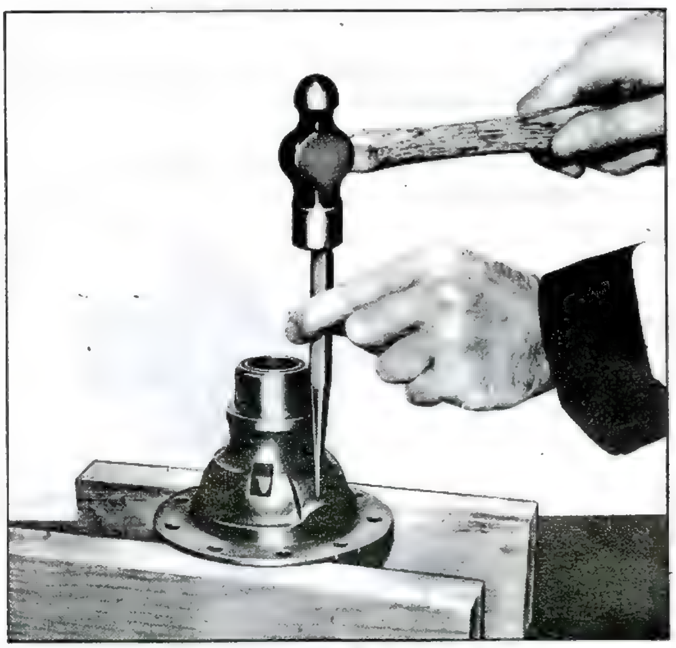


Fig. 30—Removing Pinion Gear Shaft Pin

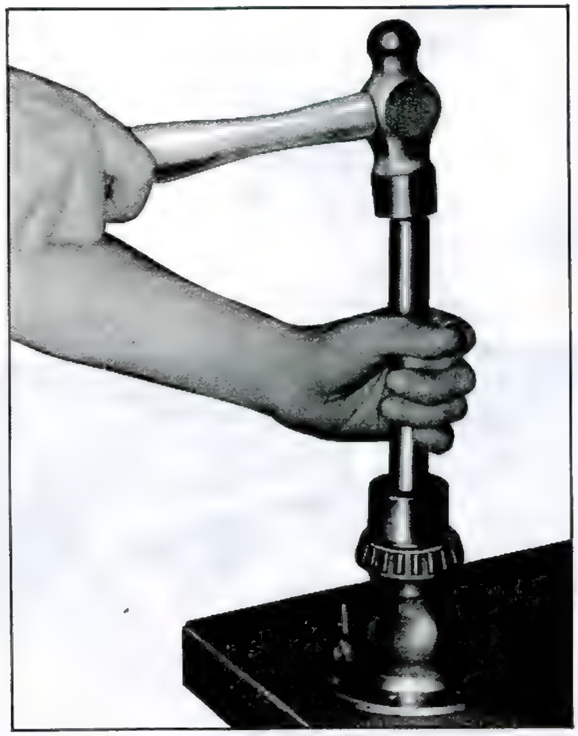


Fig. 31—Installing Differential Side Bearing with J-8359 and J-7079-2 Handle

Inspection

Refer to Figure 17.

1. Inspect differential case and cover for cracks. Be especially careful to check the case and cover for flatness and the ring gear mounting surface of the differential case.
2. Inspect the side gears for their fit into the differential case and cover respectively. Also check side gears for evidence of spline damage and broken,

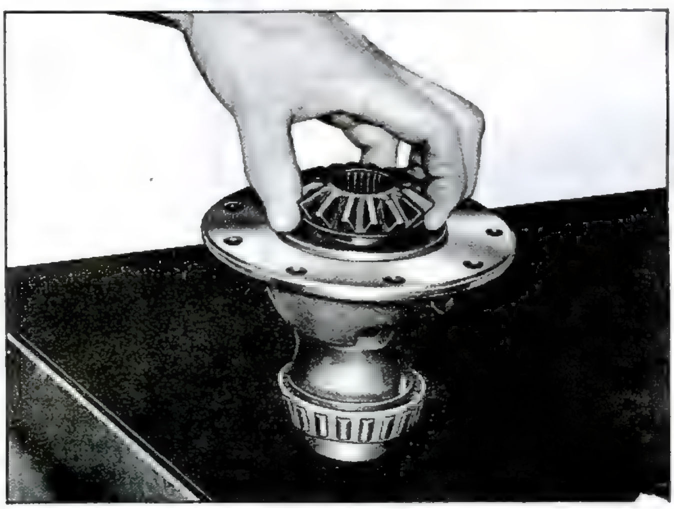


Fig. 32—Installing Side Gear in Differential Case

Fig. 33—Installing Pinion Shaft Pin

scored or worn gear teeth, check "U" joint yoke nut for wear or other defect.
3. Inspect pinion gears for cracked or chipped teeth and check their fit on the pinion shaft.
4. Replace any or all of the above parts as deemed necessary by inspection.
5. Inspect side gear and pinion thrust washers for serviceability. Replace as necessary.

Assembly

1. If side bearings require replacement, install new side bearings with J-8359 (fig. 31), on case and/or cover.
2. Place side gear (fig. 32) and thrust washer in differential case, place "U" joint yoke nut in side gear, position two pinion gears and thrust washers, and insert pinion gear shaft through case and pinion gears.
3. Position pinion shaft so that pin holes in case and shaft are aligned, and install drive pin (fig. 33) through shaft.
4. Position "U" joint yoke nut and side gear with thrust washer installed on its hub on pinions and place differential cover on case. Align punch marks on edges of differential carrier and cover (fig. 34).
5. Install two guide pins (improvised) in ring gear and tap ring gear with a plastic hammer as required to seat ring gear. Remove guide pins and install bolts and lock washers. Then tighten all bolts to specifications in an alternate pattern (fig. 35).

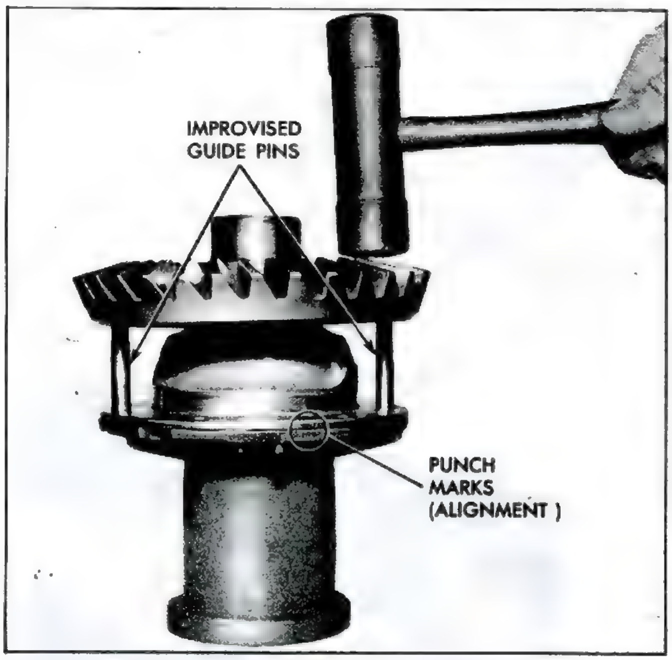


Fig. 34—Installing Ring Gear on Differential Case and Cover Using Improvised Guide Pins

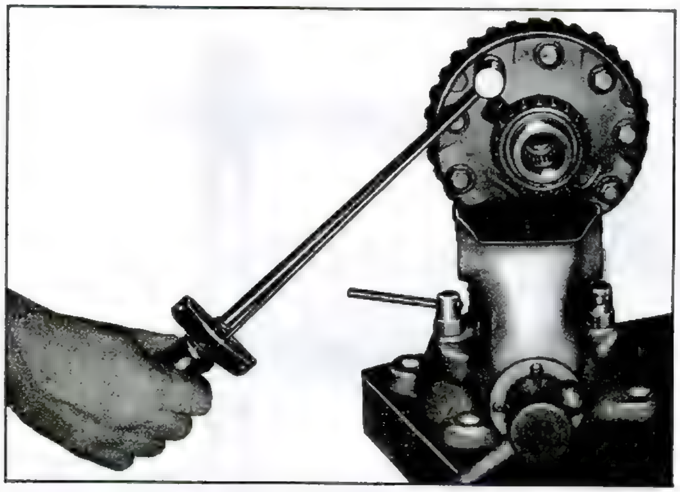


Fig. 35—Measuring Ring Gear Bolt Torque

Manual Transmission Axles Only

The following procedures apply only to rear axles used in conjunction with the manual transmissions as the components involved are peculiar to those axles.

Repairs

Clutch Release Bearing Shaft Seal Replacement

1. Remove split ring and old seal from clutch release bearing shaft by prying out with a punch or similar object.
2. Install new seal, open side inward, in shaft using a suitable socket (approximately 3/4") and socket extension (fig. 36). Drive seal until it bottoms, then install split ring in clutch release bearing shaft.

Clutch Release Bearing Shaft and/or Pinion Rear Bearing Race Replacement

1. Place the differential carrier in an arbor press and press out both clutch release bearing shaft and pinion rear bearing race.
2. If a new clutch bearing release shaft is being installed, install the inner seal as previously described.
3. Support differential carrier only on boss at clutch release bearing location with a cylinder, such as J-971, then place bearing race on clutch release bearing shaft and press both into differential carrier using J-7137. Press until cup is flush with adjacent surface inside carrier.

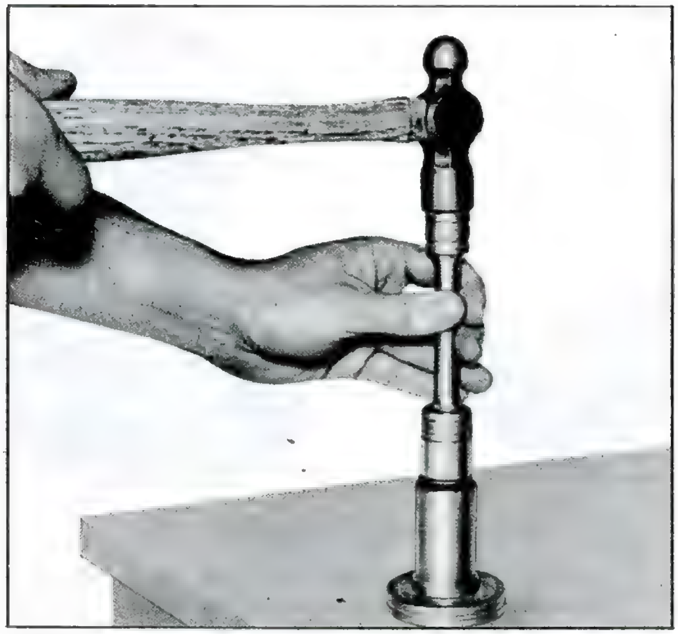


Fig. 36—Installing Clutch Release Bearing Shaft Seal with 3/4" Socket

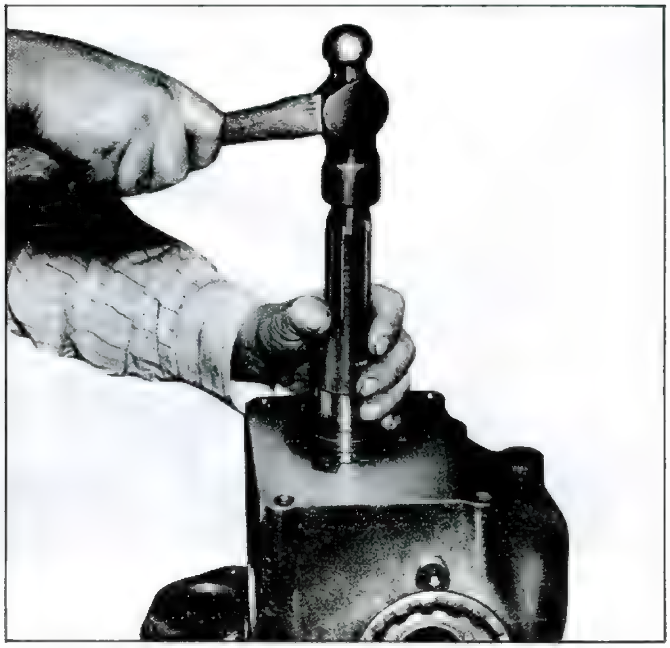


Fig. 37—Installing Pinion Shaft Front Seal with J-8340

Automatic Transmission Rear Axles Only

Repairs

The following procedures apply only to rear axles used in conjunction with automatic transmissions as the components involved are peculiar to those rear axles.

Pinion Shaft Front Oil Seal and/or Converter Hub Oil Seal Replacement

The pinion shaft front oil seal and converter hub oil seal are located diametrically opposite fore and aft respectively in the differential carrier.

However, their removal and installation is basically the same and the same Tool, J-8340, is used to drive the seal in both locations. J-8340 is specifically designed to install the pinion front seal as this seal fits into the inner diameter of the tool for installation to a prescribed depth which is provided by a stop on the tool. When used to install the converter hub seal, the stop surface of J-8340 is used to drive the seal, as this seal is mounted flush.

1. Remove the old seal by prying out with a punch or similar tool.
2. Coat outer diameter of seal with non-hardening sealer, then install new seal using J-8340 as illustrated (figs. 37 and 38). Install seals so that seal lips are toward the interior of differential carrier.

Pinion Shaft Rear Oil Seal Replacement

1. Drive out old seal with a pin punch inserted through access holes in stator shaft (fig. 39).
2. Install new seal using J-8448-1 as illustrated (fig. 40). Press seal until it bottoms.

Pinion Shaft Bushing Replacement

1. Remove old bushing from inside diameter of pinion shaft using a chisel or other suitable tool. Exercise care not to damage bushing mating surface in pinion shaft during removal.
2. Install new bushing with J-8333 as shown (fig. 41). A stop is provided on the tool to press the bushing to the prescribed depth.

Stator Shaft and/or Pinion Rear Bearing Race Replacement

1. Remove stator shaft and pinion bearing cup from carrier by placing carrier in a press and pressing downward on end of stator shaft as illustrated (fig. 42). Replace stator shaft and/or bearing cup as required.
2. Install seal ring in groove on outside diameter of stator shaft and lubricate with petroleum jelly.
3. If a new stator shaft is being installed, it will be necessary to install a new pinion rear oil seal as previously described.
4. Align notch in stator shaft (fig. 40) with drain back

Fig. 38—Installing Converter Hub Seal with J-8340

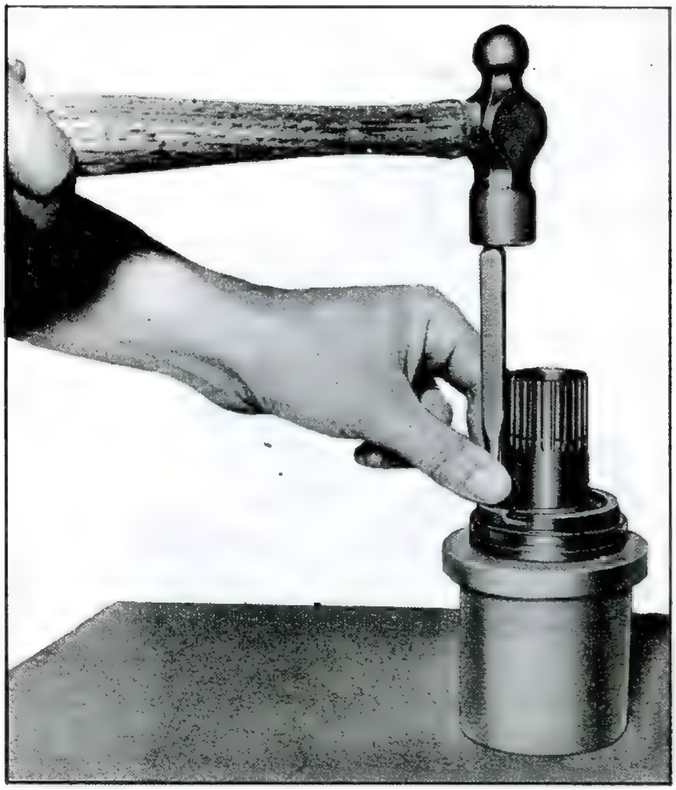


Fig. 39—Removing Pinion Rear Oil Seal from Stator Shaft

passage boss in differential carrier. Place bearing race on stator shaft and press race and stator shaft into housing carrier using J-7137 (fig. 43).

CAUTION: Carrier must be supported only at the stator shaft boss for this operation. If available, J-971 may be used for the bottom support.

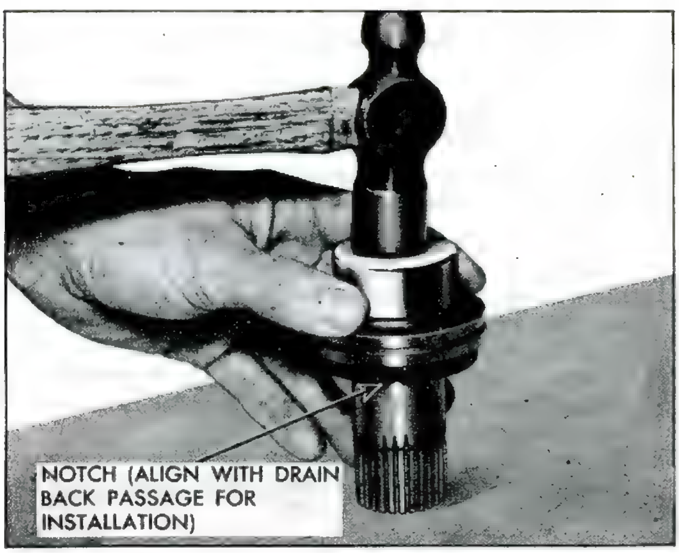


Fig. 40—Installing Pinion Rear Oil Seal in Stator Shaft with J-8448-1

Fig. 41—Installing Pinion Shaft Bushing with J-8333

Differential Carrier

Assembly

1. Mount differential carrier in J-3289-01 Holding Fixture (fig. 44).
2. Insert differential assembly into carrier with side bearing cones installed on differential hubs.

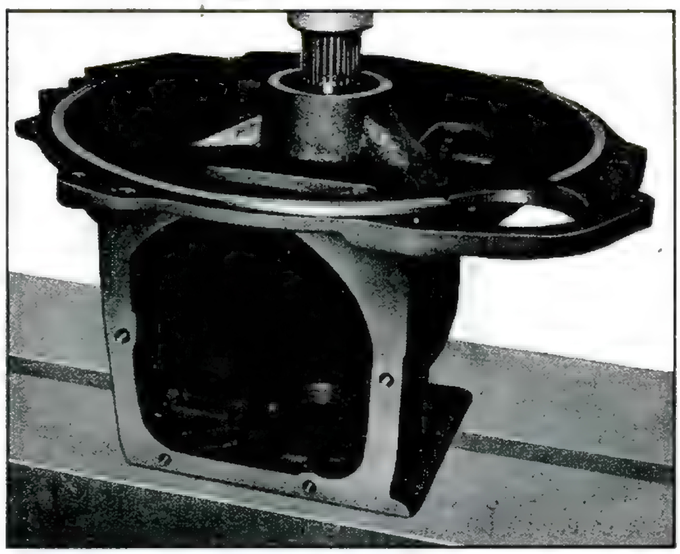


Fig. 42—Pressing Stator Shaft and Pinion Rear Bearing Race from Carrier

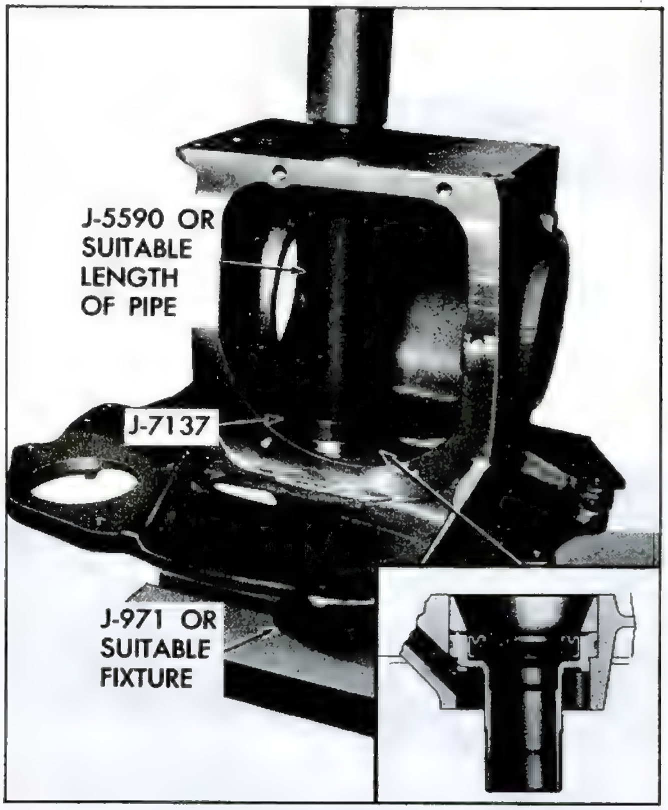


Fig. 43—Installing Stator Shaft and Pinion Rear Bearing Race

3. While differential is loose in the carrier, insert pinion into carrier through the cover hole (fig. 45). Then engage pinion with ring gear and carefully position pinion rear bearing in race. On automatic transmission models, care must be exercised not to damage the seal at this location when the pinion is installed.
4. Install new "O" ring seals in side bearing adjusting sleeves, then loosely install adjusting sleeves in carrier with differential side bearings positioned in sleeves.

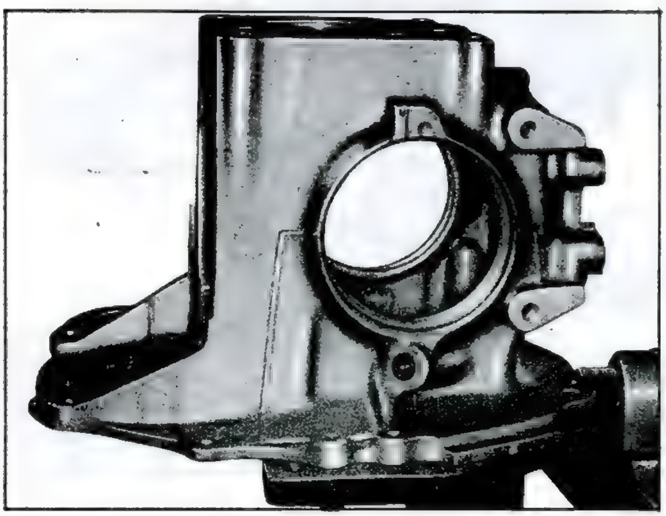


Fig. 44—Differential Carrier Installed in J-3289 Holding Fixture

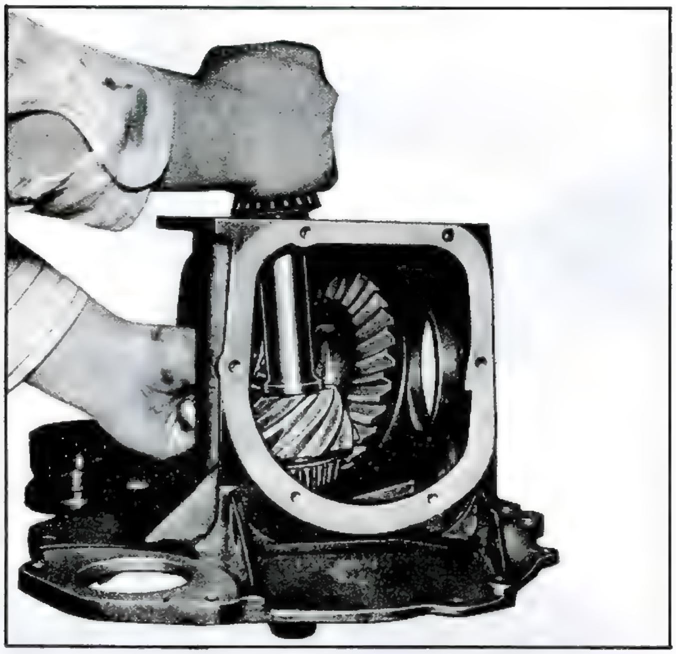


Fig. 45—Installing Pinion in Differential Carrier

5. On automatic transmission models, install a new "O" ring in pinion adjusting sleeve, position pinion so that its front bearing will pick up the bearing race in the adjusting sleeve, and then loosely install pinion adjusting sleeve in carrier. Exercise care not to damage seal lips when inserting pinion shaft over adjusting sleeve on automatic transmission axles.
6. Tighten both side bearing adjusting sleeves and the pinion adjusting sleeve to the point of contact between bearings and races. At this point, there should be no preload on any of the bearings and ring gear to pinion backlash should be just enough so that the pinion and differential can be rotated easily and smoothly. The assembly is now ready for ring gear and pinion adjustment.

Ring Gear and Pinion Bearing Adjustment

Once the differential carrier is assembled, the differential side bearings and pinion bearings must be adjusted and preloaded for quiet operation as follows:

NOTE: Lubricate bearings with axle lubricant prior to adjustment.

1. Tighten right side bearing adjusting sleeve while rocking the differential assembly with one hand until there is zero backlash between the ring gear and pinion (fig. 46). Mark this point with a crayon or pencil, then back off adjusting sleeve three to four full notches to eliminate "O" ring wind-up. Retighten adjusting sleeve to one notch loose from the zero backlash crayon or pencil mark.
2. Tighten the left side bearing adjusting nut while chucking the differential laterally until all lash is eliminated.

Mark both the adjusting sleeve and carrier, then back off sleeve three to four full notches to release any "O" ring wind-up, then retighten adjusting sleeve until marks realign plus a minimum of two

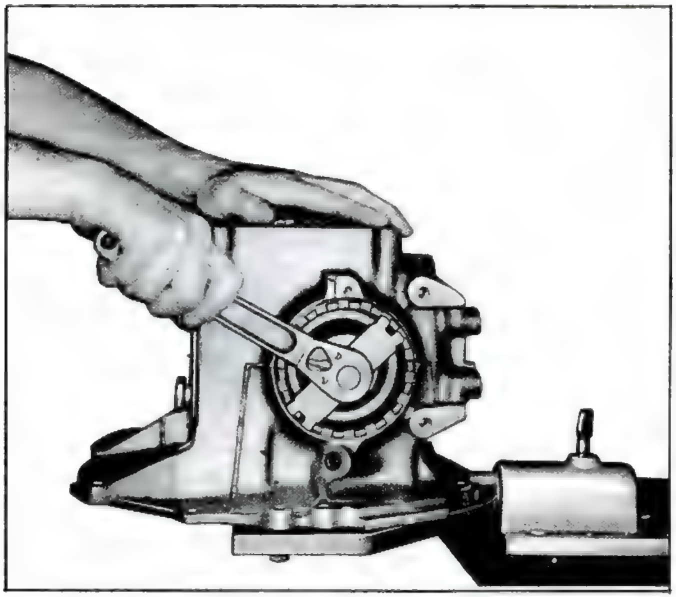


Fig. 46—Tightening Side Bearing Adjusting Sleeve with J-8342

additional notches and a maximum of three additional notches to align the sleeve notches for locking tab installation. This operation preloads the differential bearings.

3. Install differential side bearing adjusting sleeve locking tabs to prevent loss of adjustment.
4. Tighten pinion bearing adjusting sleeve with J-972 (fig. 47) until the pinion bearings are carried into contact with their races, then back off pinion adjusting sleeve slightly to eliminate any pinion bearing preload. At this point, measure the turning torque created by the side bearing preload at the pinion using J-8362 Adapter and an inch pound torque wrench such as J-5853. Record this reading (example, 8 in. lbs.). Then further tighten the pinion bearing adjusting sleeve to increase the initial turning torque by 4-6 inch-pounds with used bearings or 9-11 inch-pounds with new bearings. Using the 8 inch-pound initial turning torque from our example, the final total turning torque measured at the pinion (fig. 48) would be 12-14 inch-pounds with used bearings or 17-19 inch-pounds with new bearings.
5. When pinion bearing adjustment is satisfactory, install pinion adjusting sleeve locking tab.

Ring Gear-To-Pinion Backlash Adjustment

To check ring gear-to-pinion backlash mount a dial indicator on the differential carrier and position the indicator tip against the back of one of the ring gear teeth. Move the ring gear to either end of its lash range, zero the dial indicator, then oscillate the ring gear back and forth the extent of its lash and note indicator reading (fig. 49). Properly adjusted, the reading should indicate .003" to .010" backlash (.005"-.008" preferred).

To reduce backlash, ring gear and differential must be moved to the left (toward the pinion). Conversely to increase backlash, the ring gear and differential must be moved to the right (away from the pinion). During any re-adjustment which may be required to obtain proper backlash, be sure to move side bearing adjusting sleeves a

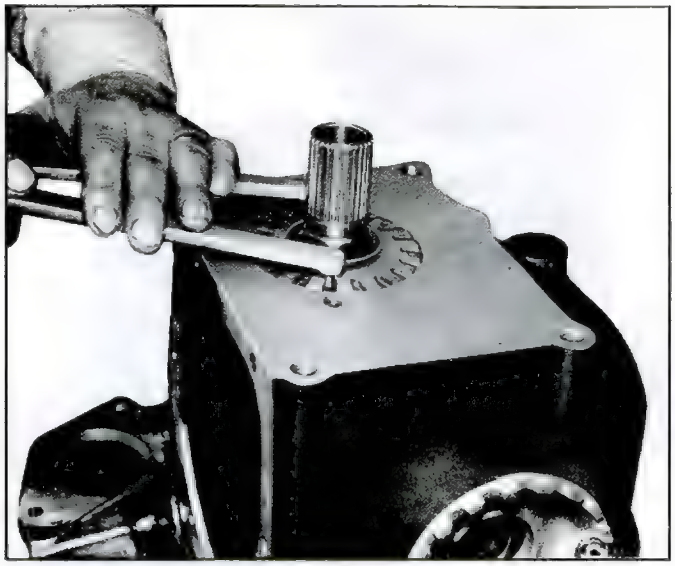


Fig. 47—Tightening Pinion Bearing Adjusting Sleeve with J-972

like number of notches to insure maintaining side bearing preload. For example, if the backlash indicated was .003" too high, loosen the left hand adjusting sleeve one notch and tighten the right hand adjusting sleeve one notch.

NOTE: Turning one notch on the adjusting sleeve changes backlash approximately .003". Adjustments of one-half notch (.0015" backlash) can be made if desired by installing the locking tab reversed.

Ring Gear and Pinion Contact Pattern

Upon completion of the ring gear-to-pinion backlash adjustment previously described, a check of the gear teeth contact pattern should be made to insure gear life and minimize bearing noise from the carrier.

1. Thoroughly clean the ring gear and pinion teeth with solvent and air-dry.

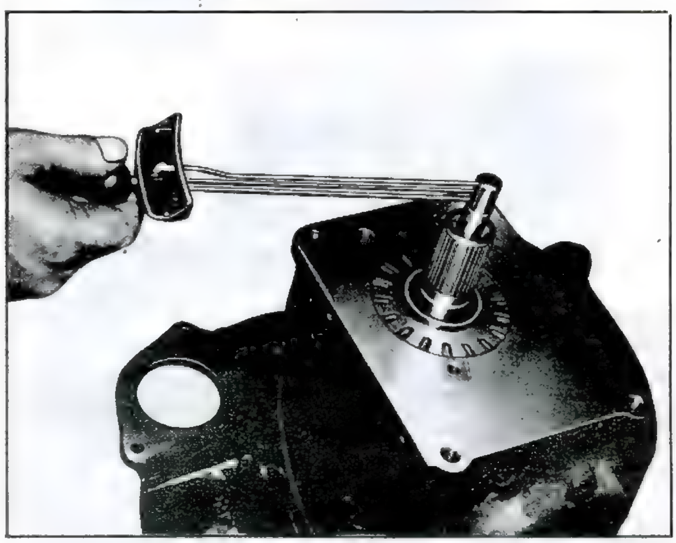


Fig. 48—Measuring Pinion Turning Torque Using J-8362 Adaptor and Torque Wrench J-5853

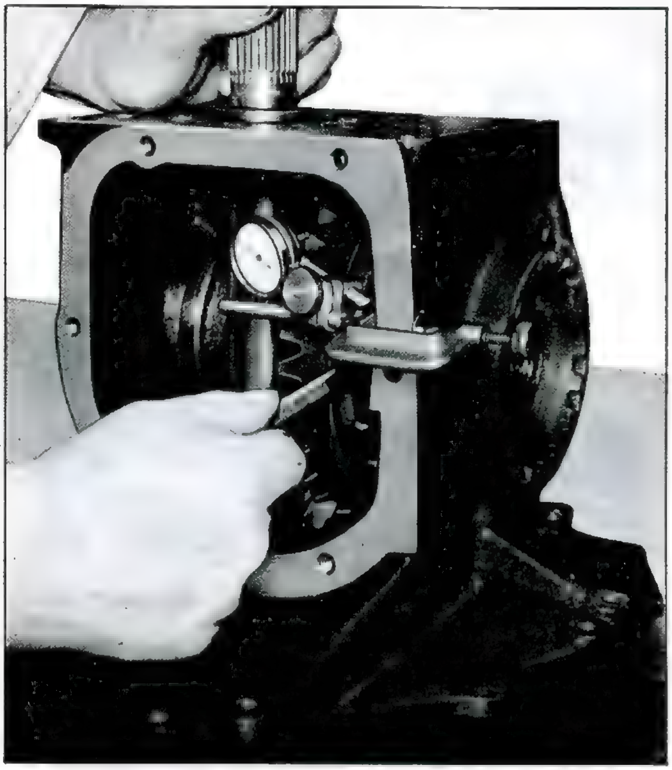


Fig. 49—Measuring Ring Gear-to-Pinion Backlash with J-8001

2. Paint ring gear teeth only with a light and even coating of a mixture of iron oxide gear marking compound and axle lubricant of a suitable consistency to produce a contact pattern on the pinion gear.

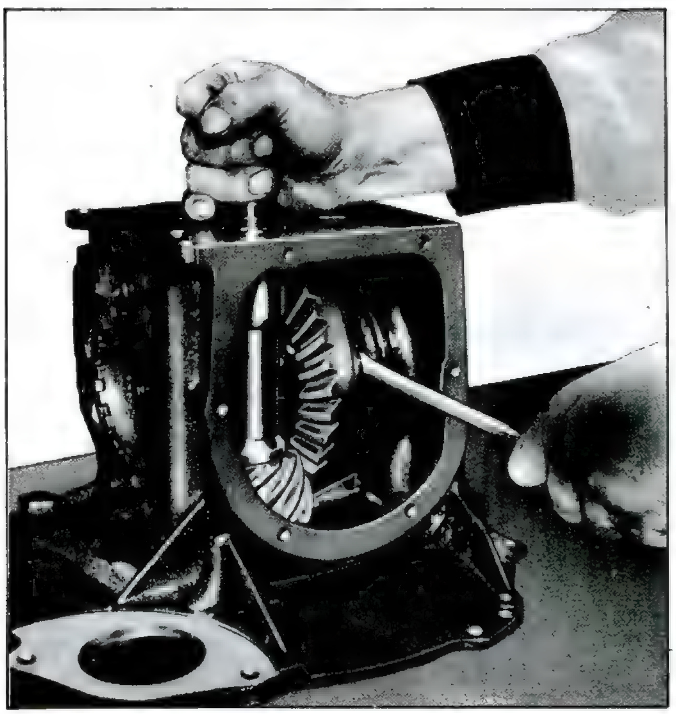


Fig. 50—Developing Contact Pattern

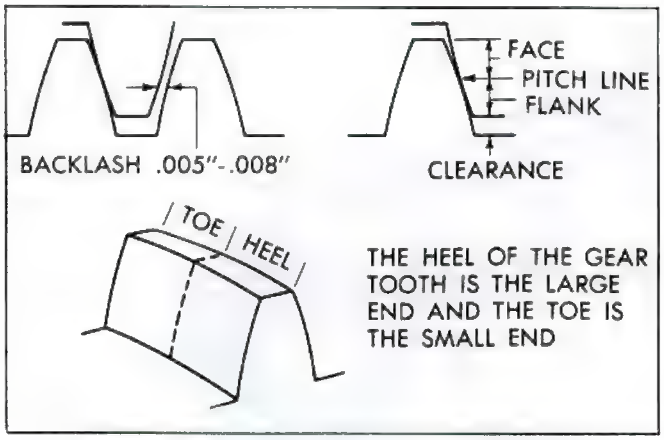


Fig. 51—Gear Tooth Nomenclature

3. While firmly holding the pinion with a rag to form a friction brake, turn the ring gear back and forth with a wrench (fig. 50) on the ring gear mounting bolts until a definite contact pattern is formed on the pinion.
4. Inspect the contact pattern produced and analyze the results relative to the following data. Figure 51 provides gear tooth nomenclature and Figure 52 illustrates the various contact patterns which mav be experienced.

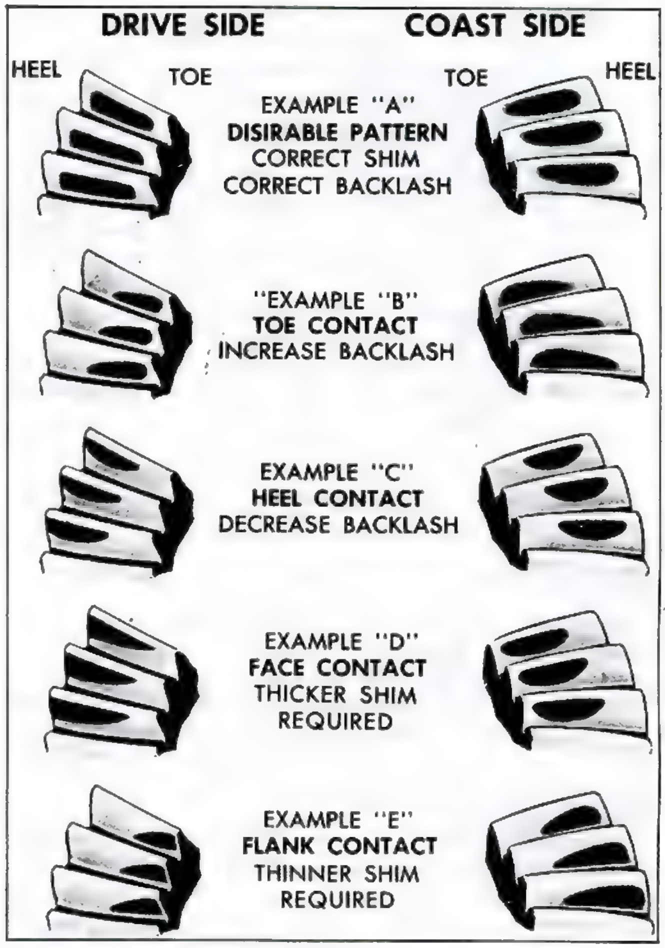


Fig. 52—Ring Gear Contact Patterns

The large end of the tooth is called the "heel" and the small end the "toe." Also, the top of the tooth, which is the part above the pitch line, is called the "face," while the part below the pitch line is called the "flank." The space between the meshed teeth is referred to as "backlash."

Figure 52 shows correct and incorrect contact patterns. For illustrative purposes, "coast" side of gear contact is shown. Drive and coast side of gear teeth will have identical contact patterns.

Tooth pattern "A" provides the ideal bearing for quietness and long life. If the pattern shows a toe contact "B," it indicates not enough backlash. To correct, move the ring gear away from the pinion by loosening left-hand differential adjusting nut and tightening right-hand adjusting nut.

NOTE: Make adjustment one notch at a time, repeat check with red lead and continue adjustment until tooth contact appears as in "A." Backlash must remain within limits.

If the pattern shows a heel contact "C," it indicates too much backlash. Make correction as for "B," however, loosen right hand differential adjusting nut and tighten left hand adjusting nut to move ring gear toward pinion. Backlash must remain within limits.

If the pattern shows a high face contact "D," it indicates that the pinion is too far out, that is too far toward the front of the car.

To correct a pattern such as in "D," it will be necessary to install a thicker pinion shim as described under "Pinion and/or Bearing Replacement." A .003" thicker shim is recommended as a starting point. Continued changes may be necessary to obtain the correct setting.

If the pattern shows a flank contact "E," it indicates that the pinion is in too far. To correct, replace the pinion shim with one .003" thinner and recheck contact pattern. Other changes may be necessary to obtain the correct pattern.

In making pinion adjustments, be sure backlash is correct before retesting for tooth pattern. Moving the pinion in reduces backlash and moving it out increases it.

NOTE: When proper tooth contact is obtained, wipe gear marking compound from gears and carrier with cloth moistened with clean gasoline or kerosene.

Pour a liberal quantity of rear axle lubricant on gear and bearing and turn gears to work lubricant into all surfaces.

5. Place a new differential carrier cover gasket on the carrier, then install cover. Tighten cover bolts to specifications.
6. Fill differential carrier to a level even with the filler plug opening.

POSITRACTION DIFFERENTIAL

The Positraction differential, available on all vehicles, is a multi-plate clutch unit incorporated into the right hand side of the differential case. The purpose of this unit is to eliminate a major amount of one-wheel slip and afford better all around traction.

A Belleville clutch plate and clutch disc, located in the clutch pack, are compressed during assembly of the differential case and cover, and provide a constant preload on the clutch pack. This preload is in addition to the load resulting from the differential side gear separating forces. The total clutch pack load provides the non-slip action of the differential under road conditions which would normally cause one wheel to slip. The assembly will act as a standard differential under cornering and straight ahead driving conditions.

Service operations on the Positraction equipped axle are the same as on a conventional axle except for the operations listed below:

Positraction Preload Check—On the Vehicle

If insufficient traction is encountered under one-wheel slip conditions, a quick check of the Positraction clutch pack preload setting can be made as follows:

1. Jack up rear of vehicle to raise both rear wheels off the ground.
2. Remove wheel and tire assembly, one side only.
3. Install Tool J-5748 with Adapter J-2619-4 to rear wheel studs (fig. 53).
4. Increase rear brake running clearance by backing off adjustment and with Torque Wrench J-2667 or equivalent, rotate axle shaft while assistant is holding other wheel. Manual transmission must be in neutral. Torque to rotate axle shaft should be 50 ft. lbs. minimum. If reading does not fall above this limit, remove differential assembly and inspect clutch pack.

NOTE: Alternate method of checking is to determine brake torque by rotating axle shaft while other wheel is free. Subtract this reading from torque reading obtained in Step 4 above to obtain true clutch pack preload.

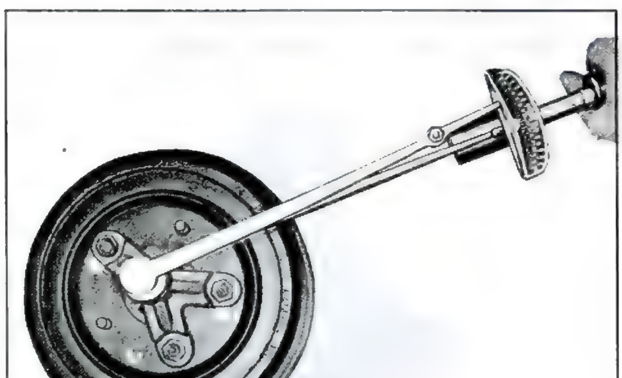


Fig. 53—Measuring Positraction Rotating Torque

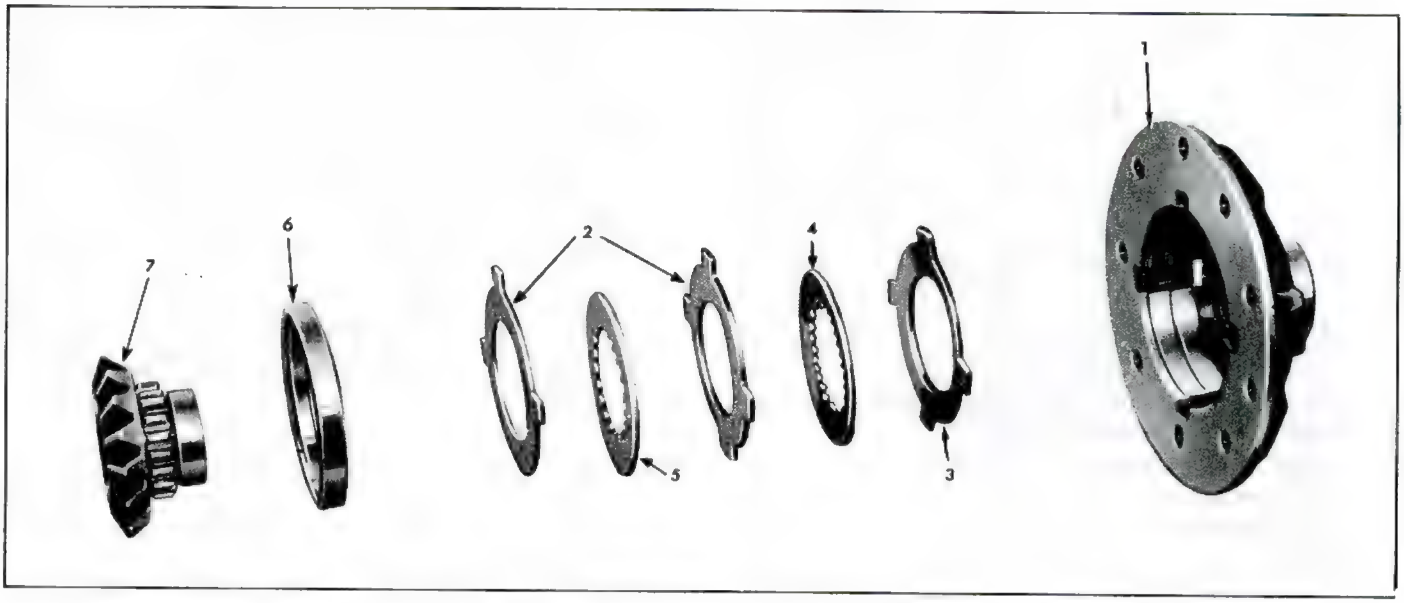


Fig. 54—Positraction Differential—Exploded View

1. Differential Cover
2. Clutch Plates
3. Belleville Clutch Plate
4. Belleville Clutch Disc
5. Clutch Disc
6. Preload Spacer
7. Side Gear

Disassembly

Refer to Figure 54.

NOTE: It should be noted during disassembly that the right hand side bearing adjusting sleeve has a shallower cross-section than used on a standard carrier. This is to provide the extra clearance needed for the Positraction unit.

1. Remove differential side bearings using Puller J-7112 and Pilot J-8107-2.
2. If hypoid ring gear is to be removed or replaced, remove the bolts securing gear to the case and remove gear.
3. Chisel or punch alignment marks on case and cover before separating (fig. 55).

   NOTE: When the differential case and cover are assembled at the factory, two flat-head 5/16-18 screws are used to hold case and cover together under the belleville spring tension prior to assembling the ring gear. It is not necessary to reinstall these screws when reassembling the differential.

4. Remove two flat head screws, if present, and separate case and cover (fig. 56). Left hand differential side gear, pinion shaft and pinions are disassembled in the same manner as the standard differential.
5. Remove right hand side gear, clutch pack preload spacer and clutch pack.

Inspection

1. Clean and inspect clutch plates and discs, preload spacer and side gear thrust surfaces for excessive wear, overheating, scoring or surface cracking and replace clutch pack when necessary.

   NOTE: Clutch pack is serviced as an assembly only.

2. Clean and inspect preload spacer mating surface on differential case for wear or damage.

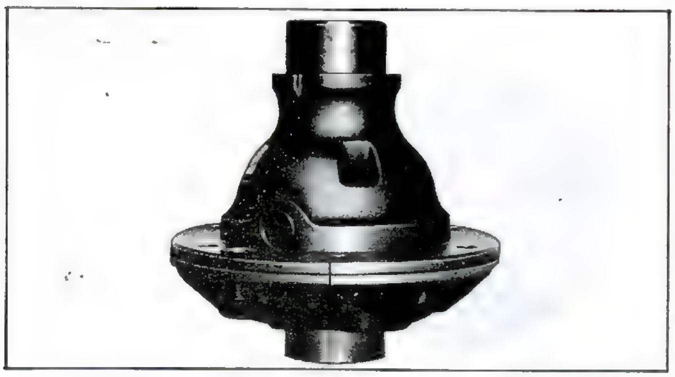


Fig. 55—Alignment Marks

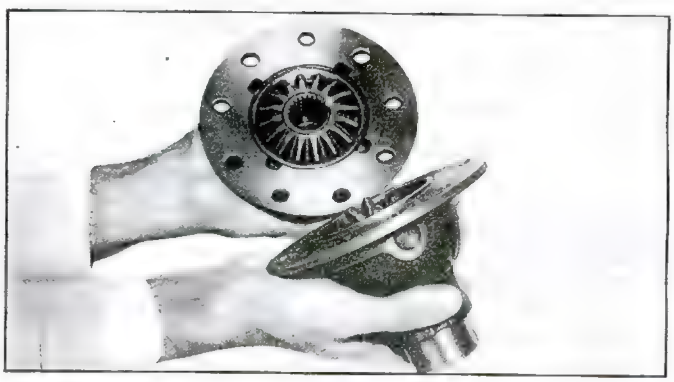


Fig. 56—Separating Case and Cover

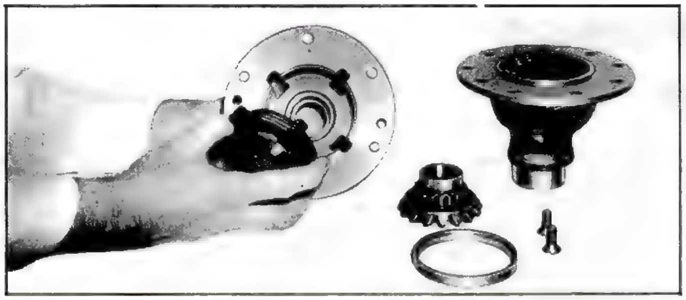


Fig. 57—Installing Clutch Pack

Assembly

1. Lightly oil clutch plates and side gear, and install clutch pack in differential as follows (fig. 57):
   a. Belleville clutch plate
   b. Belleville clutch disc
   c. Flat clutch plate
   d. Flat clutch disc
   e. Flat clutch plate
   f. Preload spacer (chamfered edge up)
2. Install side gear into clutch pack, making sure splines engage clutch plate splines (fig. 58).
3. Align differential case and cover and assemble ring gear with improvised guide pins. Remove guide pins and install ring gear bolts, drawing case and cover together, and torque to specifications.
4. Install new differential side bearing assemblies, if necessary.

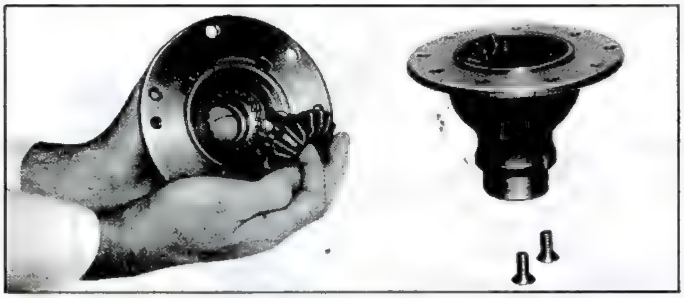


Fig. 58—Installing Side Gear

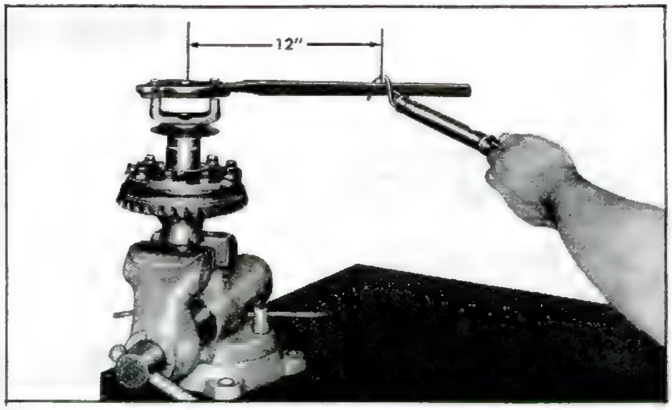


Fig. 59—Checking Clutch Pack Preload—On the Bench

Clutch Pack Preload Test—On the Bench

1. Clamp assembled differential assembly in vise with padded or suitably protected jaws.
2. Insert scrap disassembled axle shaft yoke into one side gear. Slide piece of 1" bar stock at least 14" long into yoke (fig. 59).
3. With pull scale installed 12" from differential centerline, check torque to rotate yoke and side gear (fig. 59). Torque reading should be 50 ft. lbs. minimum.

Installation

1. Install differential in differential carrier following steps outlined for the conventional differential, using the same adjustments for tooth contact, bearing preload and backlash.
2. Fill differential carrier to a level even with the filler plug opening. See Section 0 for proper lubrication.

REAR SUSPENSION

INDEX

GENERAL DESCRIPTION

The independent four-link type rear suspension (fig. 60) consists of a front and a rear strut rod with the drive shaft and the torque control arm forming four links at each wheel, and a full-coil spring mounted between the frame and torque arm.

The stamped-steel, welded, hat-section control arms are pin-jointed to the front mounting brackets through a rubber isolated bushing pressed into the arm. Rear wheel toe in angle is adjusted by positioning the horizontally slotted arm-to-body brackets to the proper setting. Wheel spindle and spindle support are attached to the torque arms through four studs which are pressed into the arm.

An adjustable bracket, attached to the transmission support, secures the inboard end of the rubber mounted front strut rod. The outboard end is rubber mounted and directly connected to the torque arm.

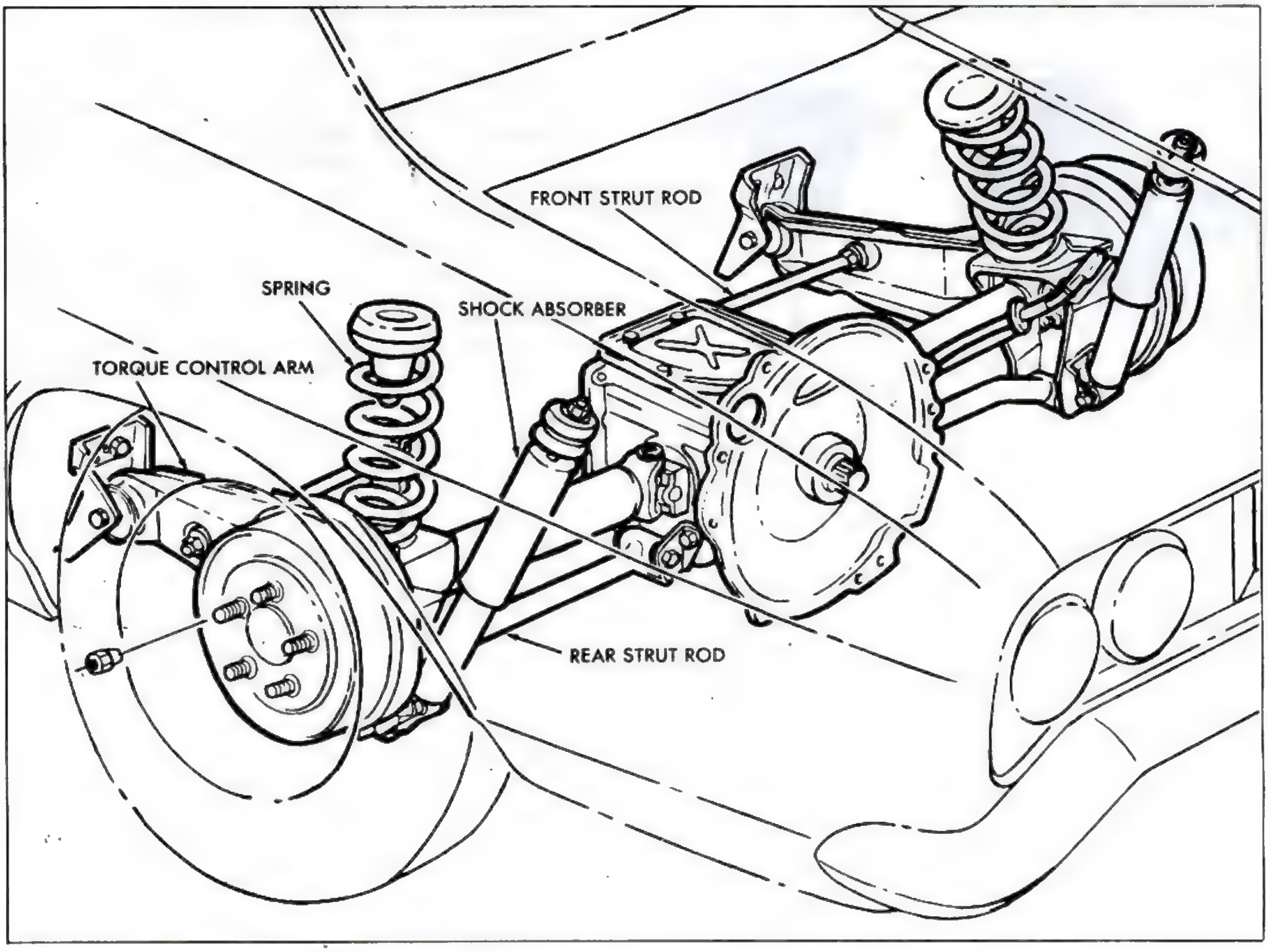


Fig. 60—Rear Suspension Components

A rear strut is mounted laterally from a bracket bolted to lower surface of axle carrier to the torque arm. The strut rod to torque arm connection provides for rear wheel camber adjustment through an eccentric cam bolt adjustment.

The rear wheel spindles are driven through double universal jointed, tubular drive shafts, which are bolted to the differential yoke and drive spindle flange. Wheel spindle support houses the inner and outer tapered roller bearings. Bearing adjustment is made through the use of a spacer and variable thickness shims between the bearings.

The direct, double-acting shock absorbers upper end is secured to an underbody bracket and at the lower end to the torque arm bracket. A full coil spring is seated against the upper surface of the torque arm and the upper end rests against the underbody side rail.

MAINTENANCE AND ADJUSTMENTS

Periodic maintenance and adjustments are not required for the rear suspension components. The suspension system should be checked for shock absorber action, condition of suspension bushings, tightness of suspension attaching bolts and an overall visual inspection of components for defects.

WHEEL ALIGNMENT

Camber

Wheel camber angle is obtained by adjusting the eccentric cam and bolt assembly located at the outboard mounting of the rear strut rod (fig. 61). Place rear wheels on alignment machine and determine camber angle. Adjust camber by loosening the cam bolt and rotating cam and bolt assembly to obtain specified camber. Tighten nut securely and torque to specifications.

Toe-in

Wheel toe-in is adjusted by moving the torque arm to underbody bracket horizontally as required to obtain specified toe-in (fig. 62). To adjust wheel toe-in, loosen front strut rod inner bracket to transmission support bolts so that bracket is loose on slots, loosen bracket to underbody attaching bolts until bracket is free enough to be moved. Position torque arm to obtain specified toe-in. Tighten affected bolts securely and torque to specifications.

WHEEL BEARING ADJUSTMENT

1. Raise rear of vehicle and remove wheel and tire assembly and brake drum.
2. Remove axle drive shaft as outlined in this section.
3. Attach dial indicator (Tool J-8001) to adjacent surface and measure wheel bearing end play (fig. 63). End play should be between .001"-.006". If reading is not within limit record reading for future reference.
4. Remove cotter pin from spindle retaining nut, install brake drum, apply parking brake and remove spindle nut and washer. Release parking brake and remove brake drum.
5. Screw Tool J-21859-1 onto spindle. Install Tool J-21859-2 to spindle flange, using the special bolts supplied with tool. Screw Tool J-8614-3 into J-21859-2 and remove spindle flange by turning J-8614-3 (fig. 64).
6. Remove two diagonally opposite nuts from spindle support retaining studs. Install Tool J-21831-1 (one on each stud) so that it bottoms against flange plate. Thread Tool J-21831-2 over J-21831-1, then remove spindle by rotating each tool an equal amount until spindle is free (fig. 65).
7. Remove spindle and bearing assembly, spacer and shim from the spindle. Then remove dust deflector and inner seal from spindle support (fig. 66).
8. Remove tool from studs, reinstall stud nuts—torque nuts to specifications.
9. Note size of shim removed. If dial indicator reading, obtained in Step 3, was over .006", select a shim thinner by the amount needed to bring end play within limits. If dial indicator reading was less than .001", select thicker shim to obtain correct movement.

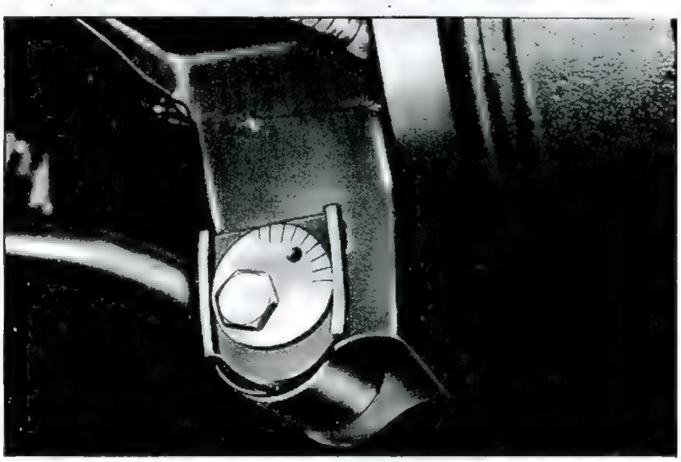


Fig. 61—Camber Adjusting Cam Location

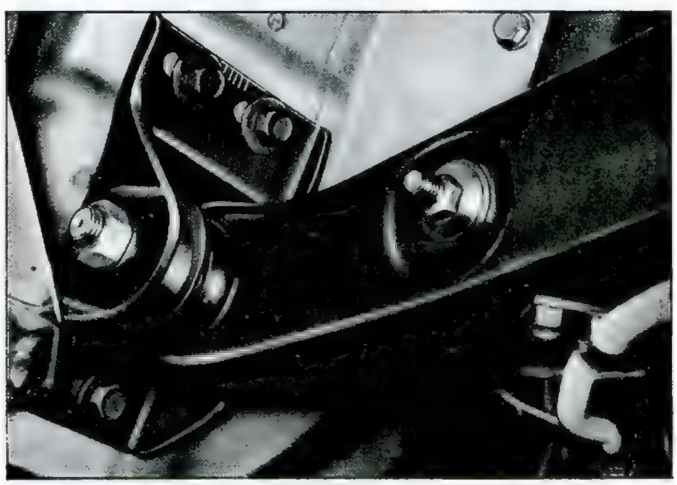


Fig. 62—Toe-in Adjusting Bracket Location

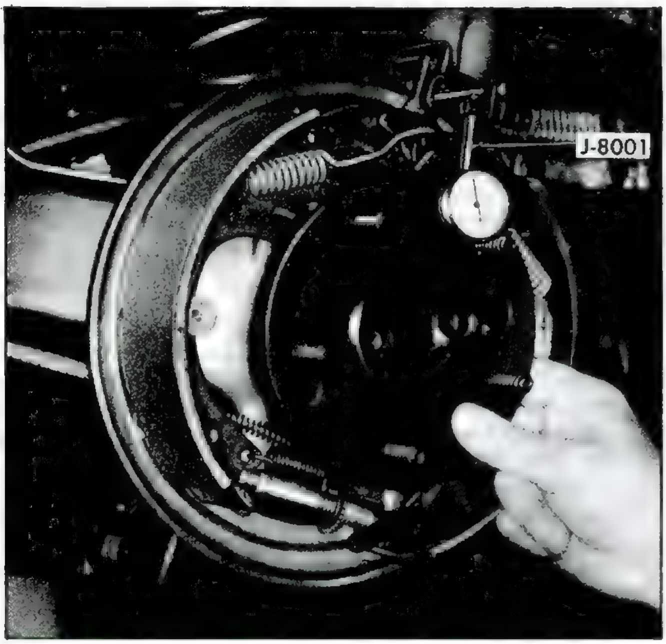


Fig. 63—Measuring Wheel Bearing End Play

NOTE: Shims are available in thicknesses from .097" to .148" in increments of .003".

EXAMPLE: Bearing end play reading was .011".

Bearing shim removed from spindle was .127".

New shim to be installed .121 (.006" smaller than shim removed).

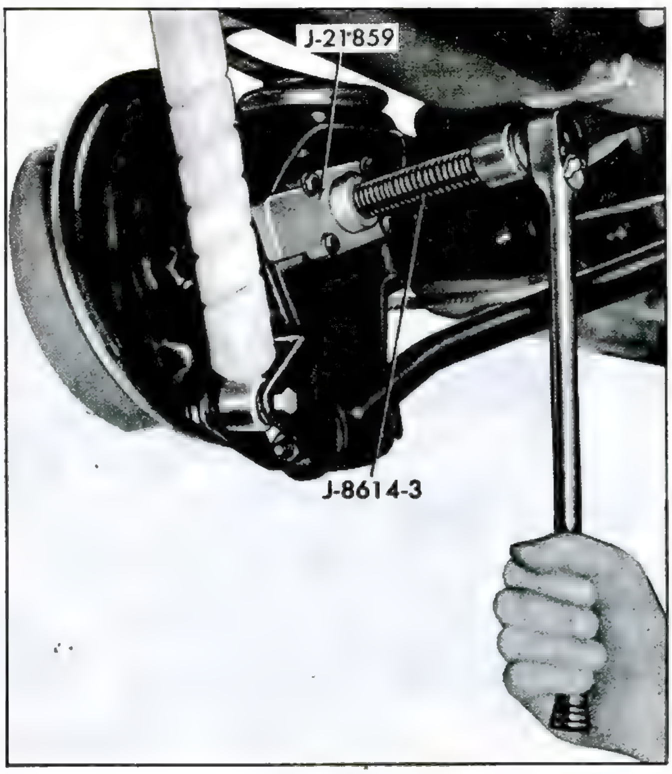


Fig. 64—Removing Wheel Spindle Flange

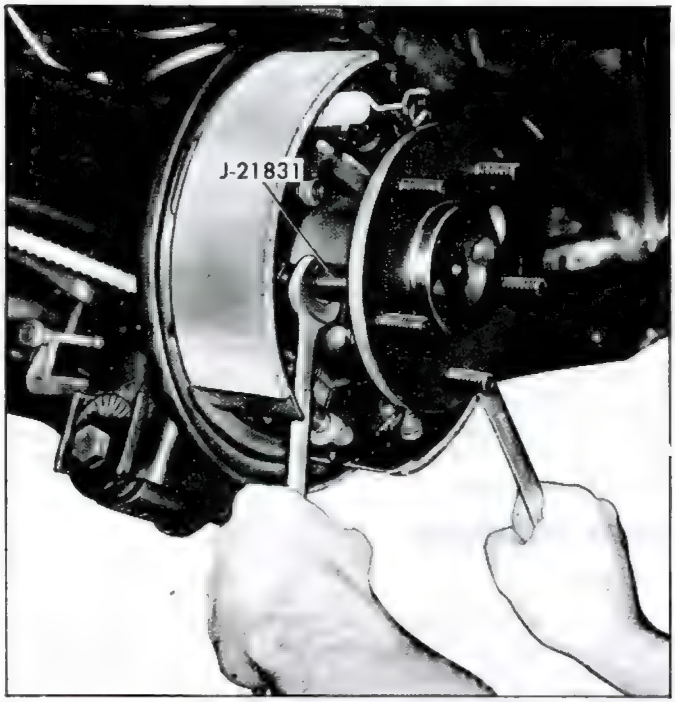


Fig. 65—Removing Wheel Drive Spindle

End play is decreased by .006" and now within the .001"-.006" limit.

10. Position spacer and shim on spindle and place assembly in spindle support.

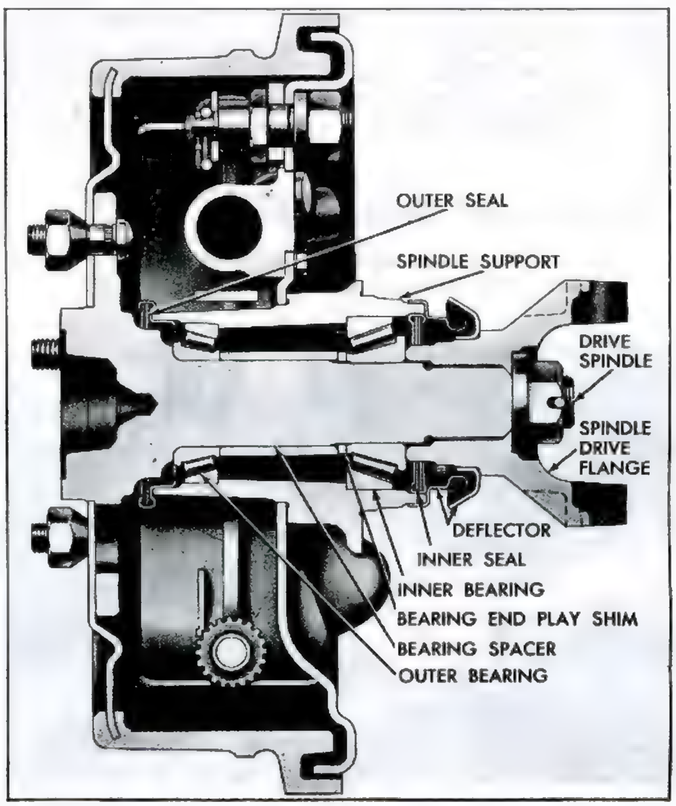


Fig. 66—Wheel Spindle and Support Cross Section

11. Install Tool J-21843-1 on drive spindle then position J-21843-2 and nut J-21843-3 over J-21843-1. Turn nut against sleeve to pull spindle into inner bearing. Remove tool from spindle (fig. 67).
12. Install spindle support inner seal, using Tool J-21837 (fig. 68), then install dust deflector to support.

    NOTE: Pack cavity of deflector with wheel bearing lubricant before installing.

13. Reinstall Tool J-21843-1 on drive spindle, position drive spindle flange over tool and onto spindle so that splines are aligned. Install sleeve (J-21843-2) and nut (J-21843-3). Tighten nut to install flange on spindle.
14. Remove Tool J-21843. Install washer and nut on spindle. Torque nut to specifications while rotating spindle and install cotter pin. If spindle hole and slot in nut do not line up, tighten nut a minimum amount, not more than 1/2 flat to align.
15. Measure bearing end play as described in Step 3. If shim thickness has been computed properly, end play should be within limits. If end play is not within limits, disassemble spindle and repeat procedure varying shim thickness as necessary.
16. Reassemble axle drive shaft as outlined in this section.
17. Install brake drum and wheel and tire assembly—torque wheel stud nuts to specifications, and lower vehicle.

RIDING HEIGHT AND REAR COIL SPRING SAG

In cases of vehicle riding height complaints, a rear coil spring height check will show if the rear suspension is at the proper height.

1. Position car on smooth, level floor. The vehicle should be at curb weight (a full tank of gasoline, but an empty front compartment except for spare tire).
2. Bounce rear end several times and allow it to settle to its normal height.
3. Measure the distance from the floor to the bottom of the rocker panel 29" ahead of center line of rear wheel (fig. 69).
4. This measurement should be 8-1/2 ± 1/2".
5. Measure the opposite side of the vehicle in a similar manner. It is essential that the two be within 1/2".
6. To correct these heights, springs must be replaced. These springs do not have flat ends and shims should not be used.

NOTE: This check should be used in conjunction with the front coil spring check to be certain that overall "sag" (trim) is within 1/2".

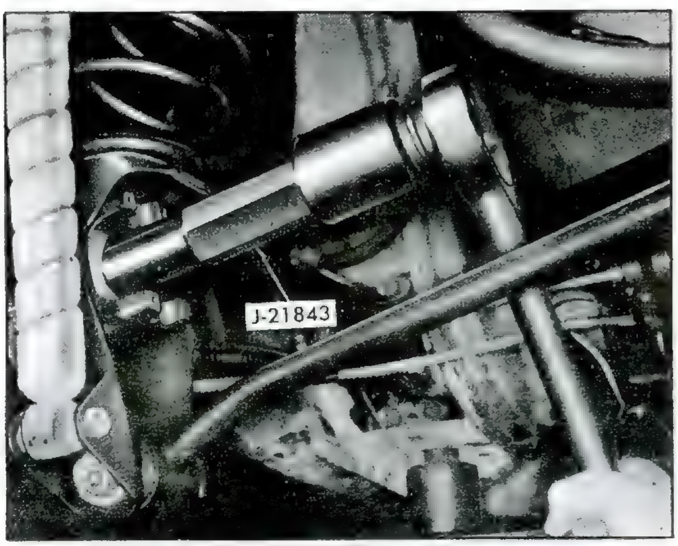


Fig. 67—Installing Wheel Drive Spindle Flange

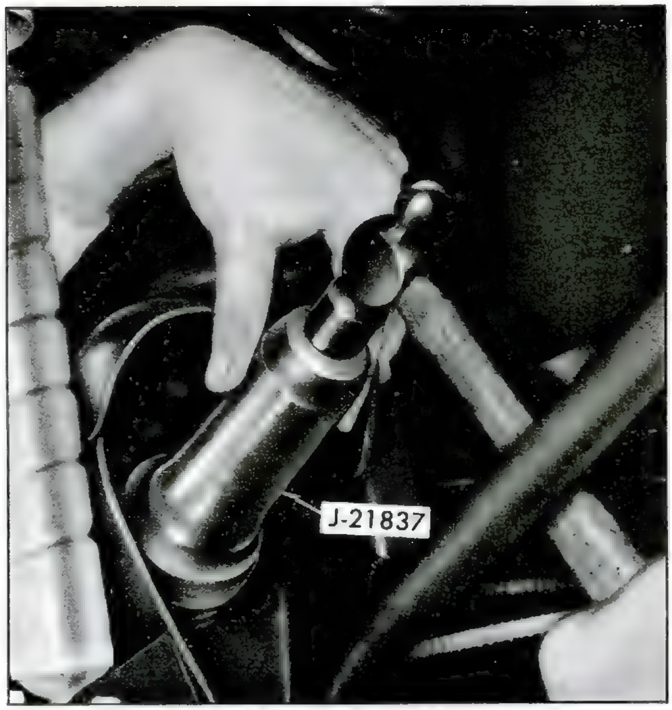


Fig. 68—Installing Spindle Support Inner Seal

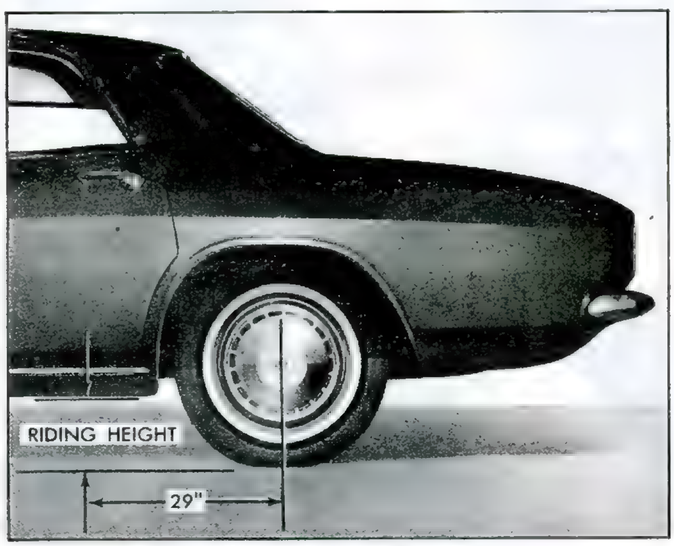


Fig. 69—Rear Riding Height

SERVICE OPERATIONS

WHEEL SPINDLE AND SUPPORT

Removal

Remove and disassemble wheel spindle assembly as outlined in "Wheel Bearing Adjustment" procedures of this section.

Repairs

1. Bearing cups may be removed while spindle support is still mounted to the torque arm, by using a brass drift to tap the cups from the support. Tap alternately against opposite side of cup to prevent unnecessary cocking while removing cups.
2. Install new bearing cups, using Tool J-8850 for outer bearing and Tool J-7817 for inner bearing (figs. 70 and 71).
3. Remove spindle outer bearing race and roller assembly, using split plates (J-8331) as shown in Figure 72. Installation of bearing can be accomplished by using bearing spacer and Tool J-9436 as a support.
4. To remove spindle support from torque arm, proceed as follows:
   a. Remove brake line from wheel cylinder inlet. Remove four nuts securing brake flange plate and spindle support to torque arm.
   b. Disconnect parking brake cable at actuating lever and remove brake flange plate and brake shoes as an assembly. If brake flange plate requires replacement, refer to Section 5 for brake shoe assembly and disassembly procedures.
   c. Separate support from torque arm and remove support from the four torque arm studs.

Assembly

1. Position spindle support over torque arm studs, then position brake flange plate and shoe assembly over support and studs. Connect parking brake cable to actuating lever. Torque stud nuts to specifications.

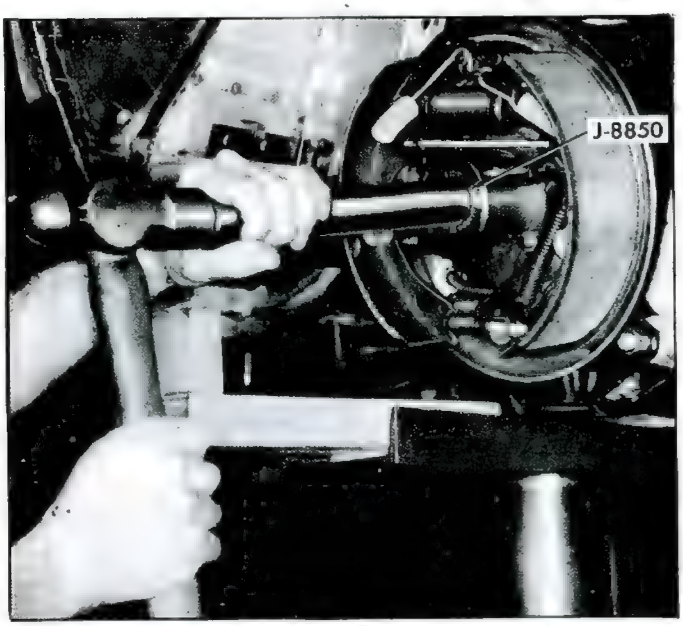


Fig. 70—Installing Spindle Support Outer Bearing

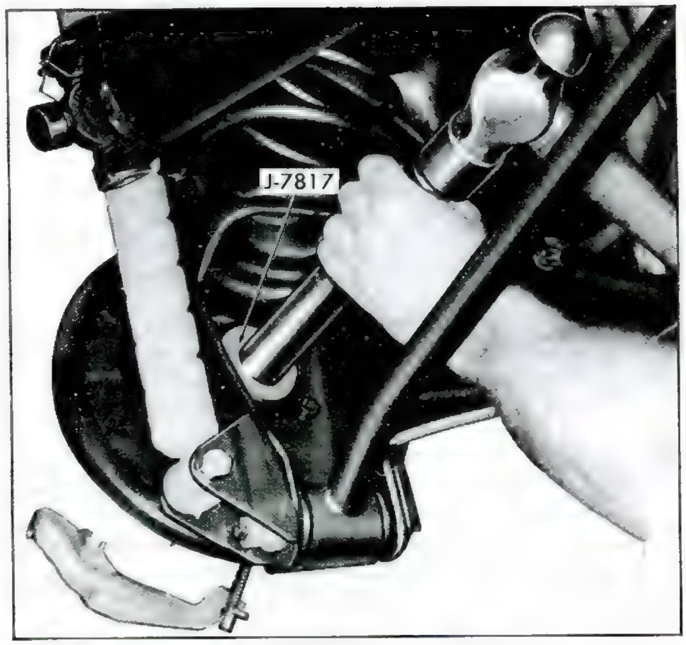


Fig. 71—Installing Spindle Support Inner Bearing

2. Install wheel spindle bearing cups in the support, using Tool J-8850 for outer bearing and Tool J-7817 for inner bearing.
3. The wheel spindle, spindle support, spindle bearings and the spindle bearing spacer are the various items that affect wheel bearing end play. Therefore when replacing any of the aforementioned items, it will be necessary to ascertain proper adjusting shim thickness to maintain specified end play. Select the shim thickness, using Tool J-21836 as follows:
   a. Remove the knurled nut from each end of gauge J-21836.
   b. Install bearing spacer over large end of gauge, then position outer bearing race and roller assembly over large end of gauge so that small end of bearing is against spacer. Install large knurled nut and hand tighten nut on gauge.
   c. Position the gauge and bearing assembly into the spindle support.

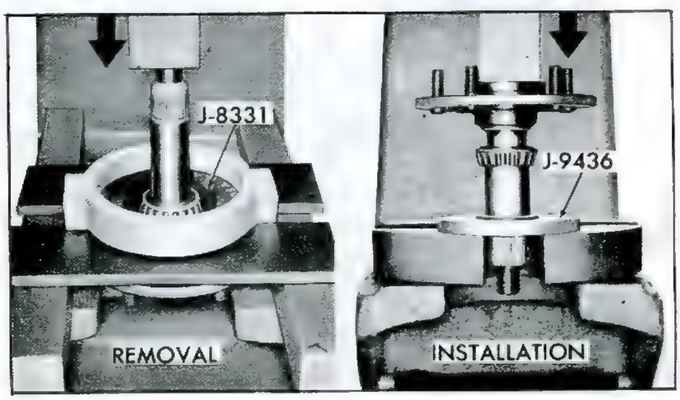


Fig. 72—Removing and Installing Drive Spindle Outer Bearing

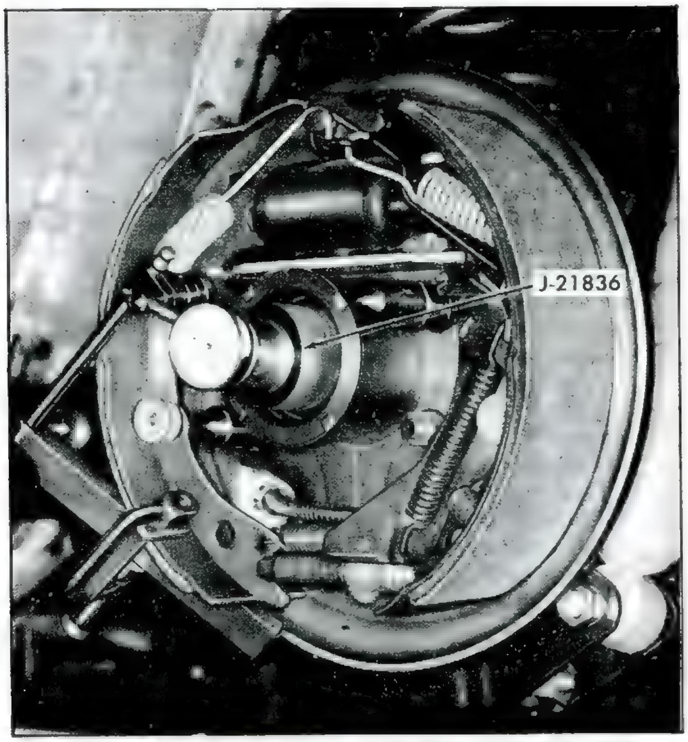


Fig. 73—Gauging Wheel Bearing Shim Requirement

d. Install the inboard spindle bearing and hand tighten knurled nut on gauge.
e. Install dial indicator (J-8001) and position indicator finger against moveable shaft of J-21836 (fig. 73).
f. Move shaft of J-21836 so that it travels the maximum permissible distance limited by spacer and inner bearing.
g. Record reading obtained in Step f—recheck to ensure accuracy.
h. To the reading obtained in Step f, add 0.097". The total obtained is the required shim thickness necessary to maintain specified end play.

EXAMPLE: Dial indicator reading obtained in Step f: 0.026"

Add 0.097" to dial indicator reading (Gauge J-21836 is constructed to represent the smallest shim, which is 0.097") 0.097"

Shim thickness required (TOTAL): 0.123"

Shim to be installed woud be 0.124" thick since this is the shim with a thickness nearer to the value as computed above.

4. Disassemble gauge and install spindle outer bearing on spindle as shown in Figure 72. Pack both wheel bearings with a high-melting point wheel bearing lubricant prior to installation.
5. Position support outer seal on Tool J-21842 (align notches in seal with slots in tool) and install seal in support (fig. 74).
6. Reassemble spindle to spindle support as outlined in "Wheel Bearing Adjustment" procedures of this section.

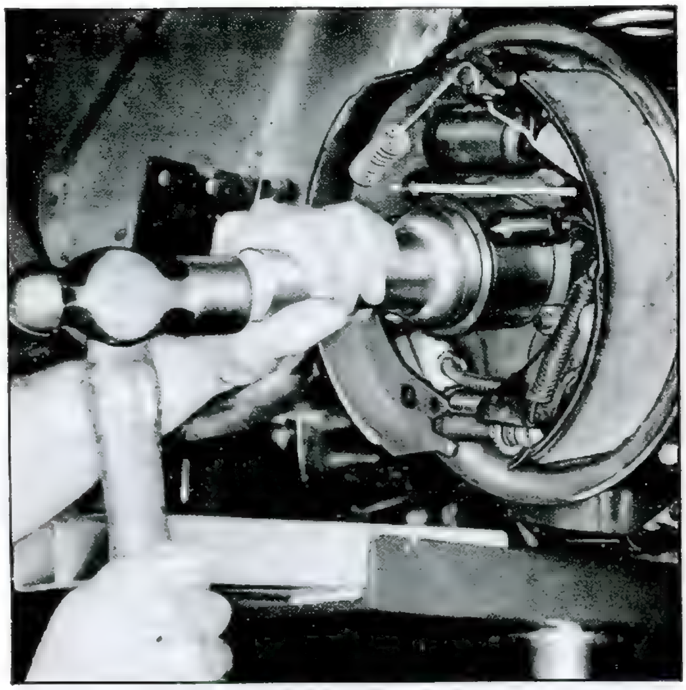


Fig. 74—Installing Spindle Support Outer Seal

7. Reassemble axle drive shaft as outlined in this section.
8. Connect brake line at wheel cylinder inlet.
9. Install brake drum and wheel and tire assembly—torque wheel stud nuts to specifications.
10. Bleed brakes as outlined in Section 5.

SHOCK ABSORBER REPLACEMENT

1. Raise engine compartment lid and remove shock absorber upper attaching nut, retainer and grommet (fig. 75).
2. Raise rear of vehicle to obtain access to shock absorber attachment at rear of torque control arm.
3. Remove bolt securing shock absorber to torque arm bracket and withdraw shock from vehicle.
4. Extend upper portion of shock absorber into underbody bracket so that it protrudes into the engine compartment.
5. Install grommet, retainer and nut to shock absorber upper attaching rod in the engine compartment—torque nut to specifications.
6. Position shock absorber lower eye into torque arm bracket and install through bolt. Install lock washer and nut—torque nut to specifications.
7. Lower vehicle and test shock absorber action.

REAR STRUT ROD AND BRACKET REPLACEMENT

1. Raise rear of vehicle to obtain working clearance. Remove wheel and tire assembly and support torque arm so that spring is compressed to be near curb height.
2. Disconnect strut rod bracket at differential carrier (fig. 76).
3. Mark relationship of camber cam to torque arm bracket so that they may be reassembled in same location.
4. Remove cam bolt retaining nut and remove cam bolt

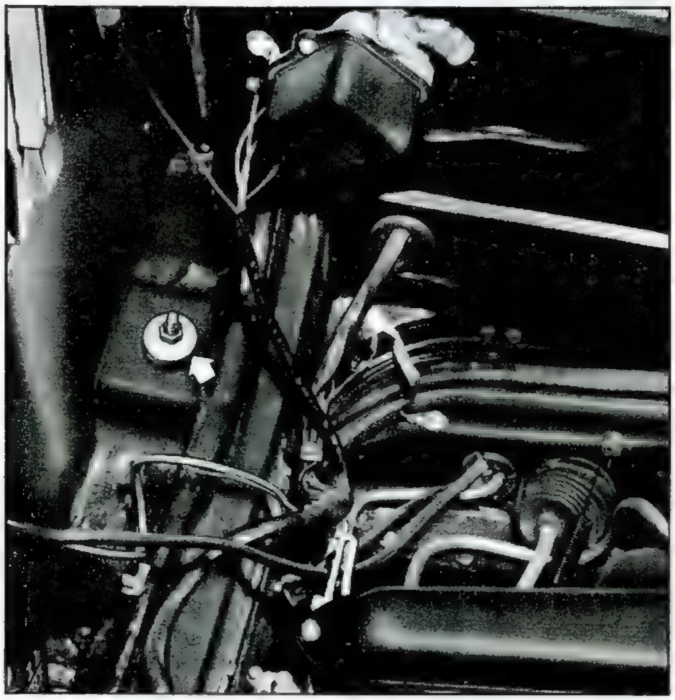


Fig. 75—Shock Absorber Upper Attachment Location

and cam, then pull strut rod out of bracket and remove bushing caps.

5. Place strut rod and bracket assembly in a vise and remove strut rod to bracket through bolt. Separate bracket and strut rod then remove bushing caps from strut rod.
6. Install bushing caps to inboard end of strut rod and position rod to bracket. Install pivot bolt, washer and nut—tighten nut but do not torque at this time.

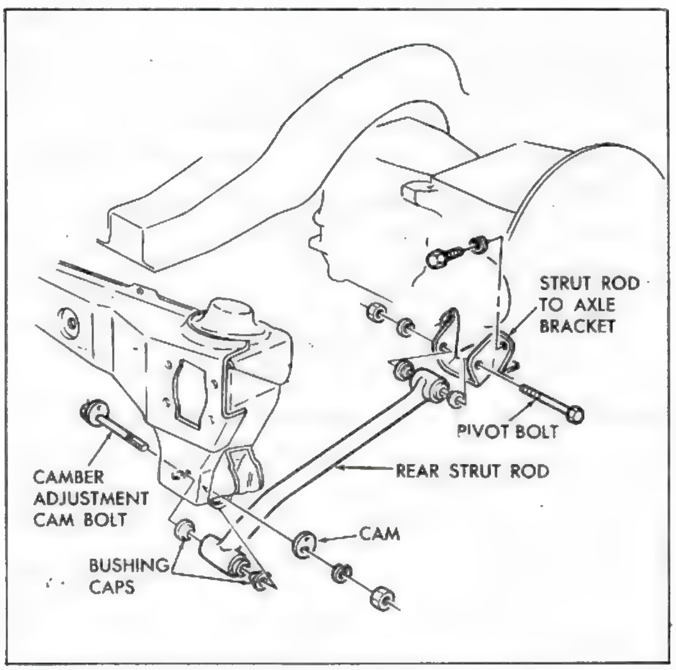


Fig. 76—Rear Strut Rod Attachment

7. Install bushing caps to outboard end of strut rod and position rod to bracket at torque arm. Install cam bolt and cam. Install cam bolt nut and tighten, but do not torque at this time.
8. With spring compressed as in Step 1, position strut bracket to differential carrier. Install bracket-to-differential carrier bolts and torque to specifications. To prevent distortion to strut bracket it is recommended that the retaining bolts be installed in the following manner:
   a. Using a long drift, align bracket with differential carrier and install the forward bolt on the side of carrier. Do not tighten bolt. Installation of remaining bolts will require further alignment.
   b. Align bracket with rear bolt on underside of carrier, using drift to align bracket during bolt installation.
   c. Install rear bolt on side of carrier, then install remaining bolt to underside of carrier.
   d. Alternately tighten all bolts in small increment to permit an even draw against bracket. Tighten all bolts snugly and check bracket for proper seating against carrier. Torque all bolts to specifications.
9. Align camber cam with reference mark on torque arm bracket and tighten nut to retain setting. If strut rod has been replaced, camber setting should be checked.
10. Remove support from torque arm, install wheel and tire assembly, lower vehicle so that weight rest on wheels and torque strut rod and wheel nuts.

FRONT STRUT ROD AND BRACKET REPLACEMENT

1. Raise vehicle sufficiently to permit access to front strut rod bracket at transmission support.
2. Disconnect strut rod bracket at transmission support by removing the retaining nuts (fig. 77).
3. Remove nut, retainer and grommet securing strut rod to torque arm.
4. Remove strut rod and bracket assembly from torque arm and clamp bracket in vise. Remove nut, retainer and grommet securing strut rod to bracket.
5. Position retainer and grommet against shoulder on strut rod then place strut rod in bracket. Install grommet, retainer and nut to retain strut rod to bracket.

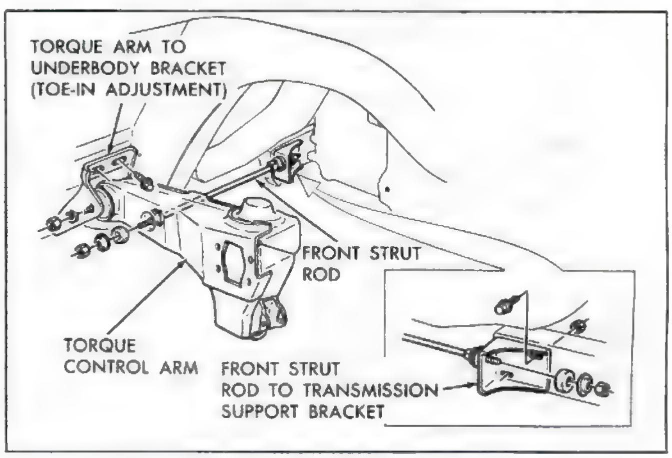


Fig. 77—Front Strut Rod Attachment

6. Position retainer and grommet on opposite end of strut rod then place end through torque arm and place grommet, retainer and nut on protruding end of strut rod.
7. Position bracket to transmission support, then install retaining screws and nuts.
8. Torque all parts to specifications and lower vehicle to floor.

SPRING REPLACEMENT

1. Raise rear of vehicle, position stand jacks at jacking pads and remove wheel and tire assembly.
2. Position hydraulic jack under torque arm (fig. 78), raise torque arm and compress spring so that it is near curb height.
3. Disconnect rear strut rod bracket at the differential carrier.
4. Disconnect shock absorber at torque arm bracket, then slowly release hydraulic jack permitting spring to relax until it is fully expanded.
5. Remove spring, spring retainer and cushion from the vehicle (fig. 79).
6. Place spring retainer and cushion on spring so that spring end rest against stop on retainer, then place assembly between torque arm and under body bracket. Make sure spring is indexed in both the upper and lower seats.
7. Slowly raise hydraulic jack to partially compress spring, then connect shock absorber to torque arm bracket.
8. With shock absorber installed to torque arm, continue to raise hydraulic jack until spring is at curb position. Connect rear strut rod bracket to differential carrier.
9. Remove hydraulic jack and install wheel and tire assembly.
10. With weight of vehicle resting on suspension, torque affected attaching parts to specifications.

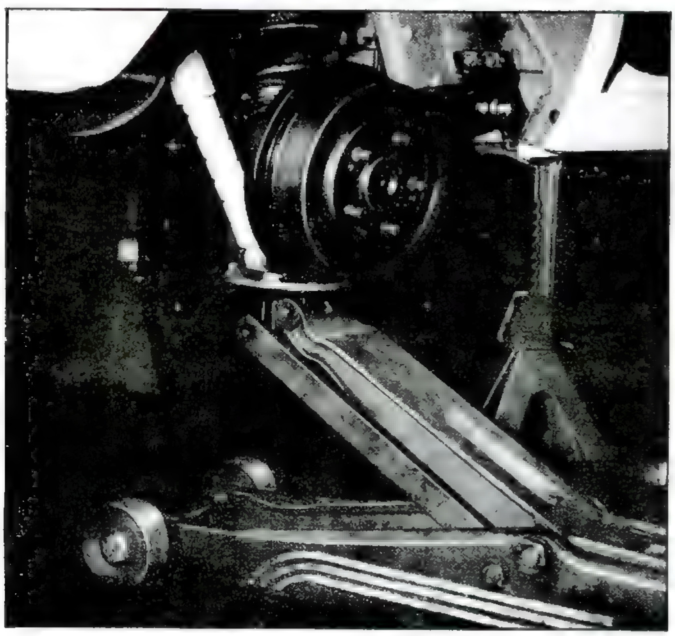


Fig. 78—Positioning Jack for Spring Removal

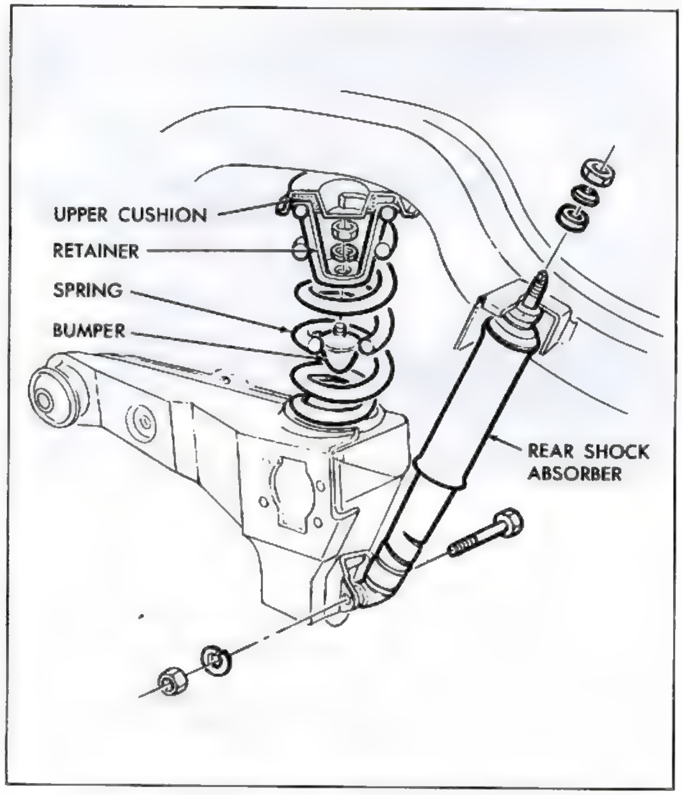


Fig. 79—Spring and Shock Absorber Installation

TORQUE CONTROL ARM BUSHING REPLACEMENT

1. Raise rear of vehicle and remove spring and front strut rod as outlined in this section.
2. Mark relationship of torque arm toe-in bracket to underbody and disconnect bracket from underbody.
3. Remove the bracket from torque arm and install bushing removal tools as shown in Figure 80.
4. Install new bushing to torque arm using tools as shown in Figure 81.

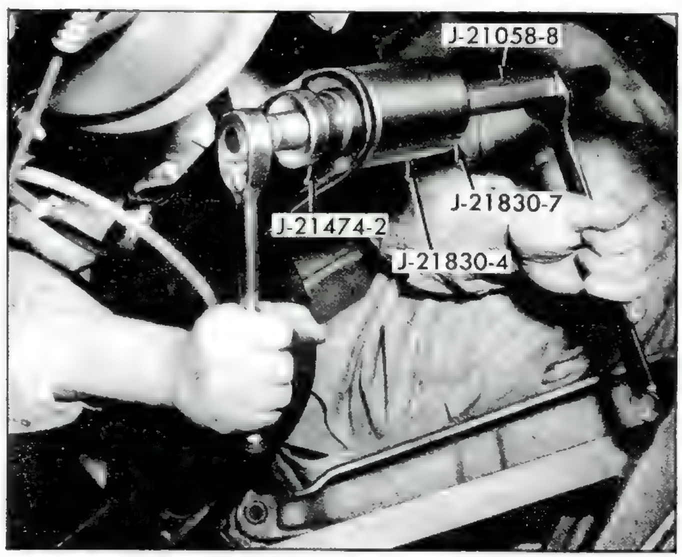


Fig. 80—Removing Torque Control Arm Bushing

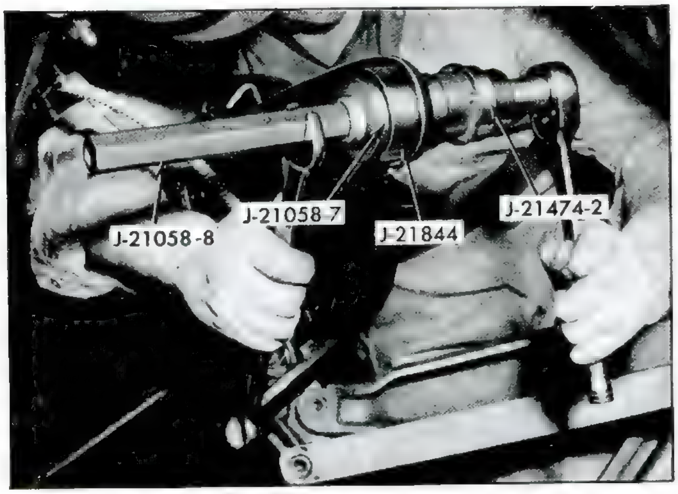


Fig. 81—Installing Torque Control Arm Bushing

5. Reinstall bracket to torque arm and vehicle underbody using reference mark established in Step 2.
6. Reinstall spring and front strut rod as outlined in this section.
7. With weight of vehicle resting on suspension, torque affected attaching parts to specifications. Check toe-in setting and adjust if necessary.

TORQUE CONTROL ARM REPLACEMENT

1. Raise rear of vehicle, then remove spring, shock absorber at lower attachment, axle drive shaft and front and rear strut rods as outlined in this section.
2. Remove brake drum, disconnect hydraulic brake line at wheel cylinder inlet and at torque arm bracket, then disconnect parking brake cable at actuating lever and at torque arm.
3. Remove the torque arm-to-spindle support retaining nuts, then remove the spindle, spindle support and brake flange plate as an assembly (fig. 82).

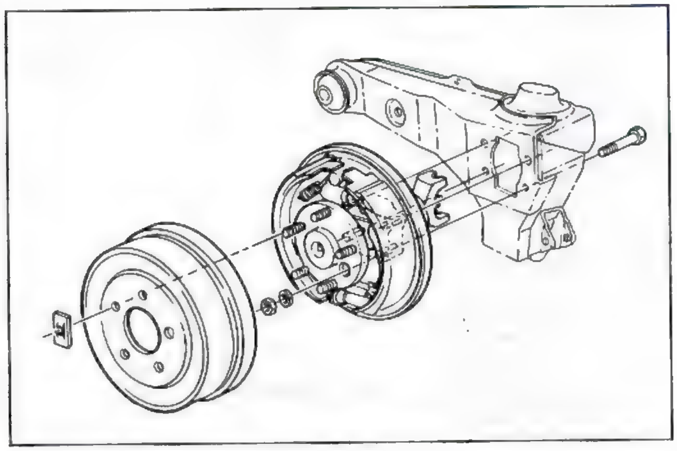


Fig. 82—Rear Wheel Spindle, Support and Brake Removal

4. Mark relationship of toe-in bracket to underbody and disconnect torque arm toe-in bracket from underbody, then separate bracket from torque arm.
5. Install toe-in bracket to torque arm, then loosely install toe-in bracket to vehicle underbody. Align bracket with reference mark on underbody.
6. Install spring, shock absorber, and front and rear strut rods following procedures outlined in this section.
7. Position spindle, spindle support and brake flange plate assembly in torque arm and secure with stud nuts.
8. Connect parking brake cable to actuating lever and to torque arm.
9. Connect hydraulic brake line to torque arm bracket and to wheel cylinder inlet.
10. Install axle drive shaft, brake drum and wheel and tire assembly.
11. Bleed brakes as outlined in Section 5.
12. With weight of vehicle resting on suspension, torque affected attaching parts to specifications.

SPECIAL TOOLS

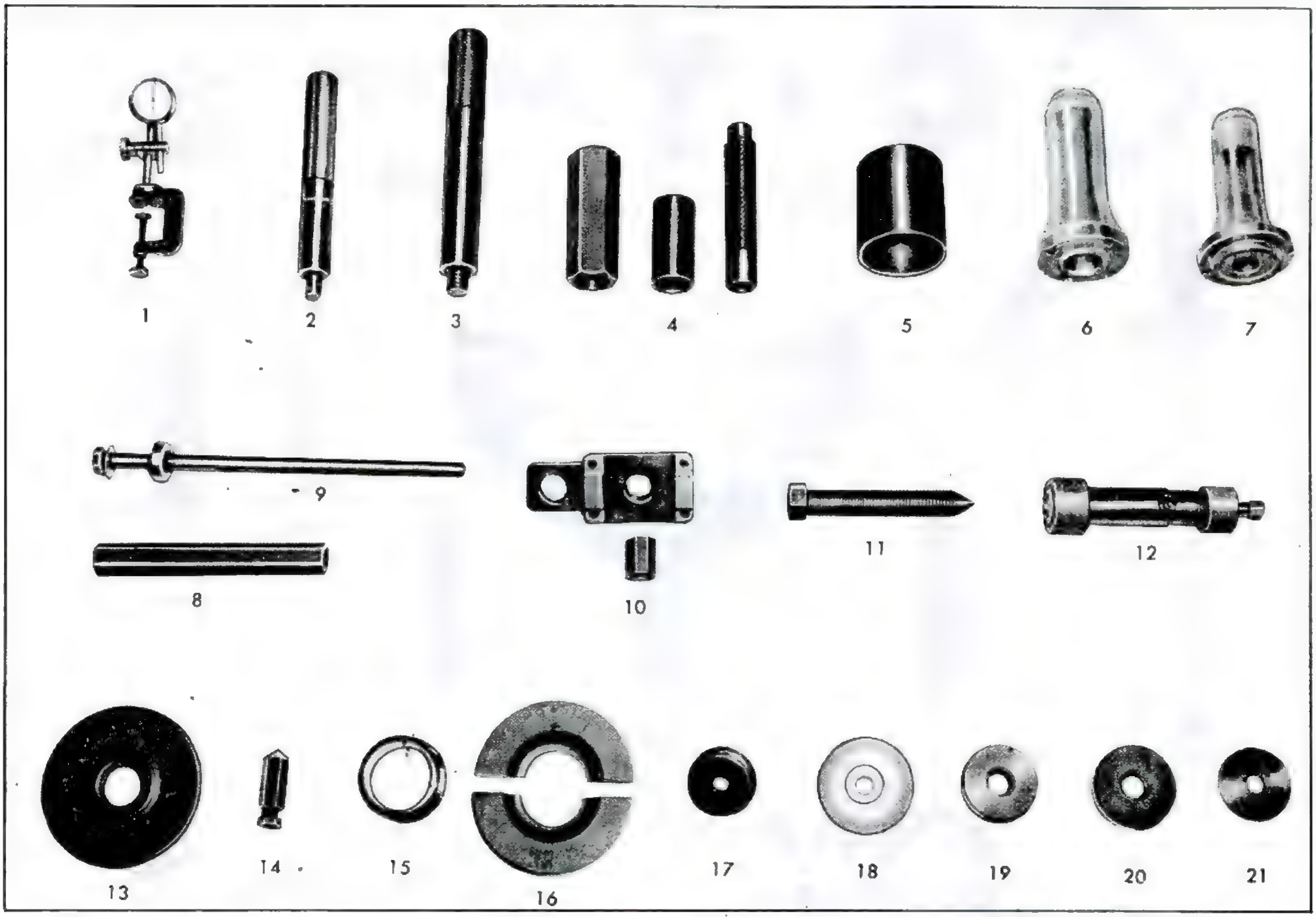


Fig. 83—Special Tools (Rear Suspension)

1.	J-8001	Dial Indicator Set (Use with J-8364 Stand—not Illustrated)
2.	J-7079-2	Driver Handle (insert type)
3.	J-8092	Driver Handle (threaded type)
4.	J-21843	Wheel Drive Spindle Flange and Bearing Installer—Consists of 21843-1 Bolt, 21843-2 Sleeve and 21843-3 Nut
5.	J-21830-4	Torque Arm Bushing Remover Sleeve
6.	J-21837	Drive Spindle Inner Seal Installer
7.	J-21842	Drive Spindle Outer Seal Installer
8.	J-21058-8	Torque Arm Bushing Remover Nut
9.	J-21058-15	Torque Arm Bushing Remover Bolt
10.	J-21859	Drive Spindle Flange Remover—Consists of J-21859-1 Nut, J-21859-2 Plate and J-21859-3 Bolt. Used with J-8614-3.
11.	J-8614-3	Drive Spindle Flange Remover Power Screw
12.	J-21836	Drive Spindle Spacer Selector Gauge
13.	J-9436	Drive Spindle Outer Bearing Installer Plate
14.	J-21831	Drive Spindle Remover—Consists of J-21831-1 Bolt, and J-21831-2 Nut
15.	J-21844	Torque Arm Bushing Installer
16.	J-8331	Drive Spindle Outer Bearing Remover Plates
17.	J-21474-2	Torque Arm Bushing Adapter
18.	J-21830-7	Torque Arm Bushing Bridge
19.	J-8850	Drive Spindle Outer Bearing Installer
20.	J-7817	Drive Spindle Inner Bearing Cup Installer
21.	J-21058-7	Torque Arm Bushing Adapter

SPECIAL TOOLS

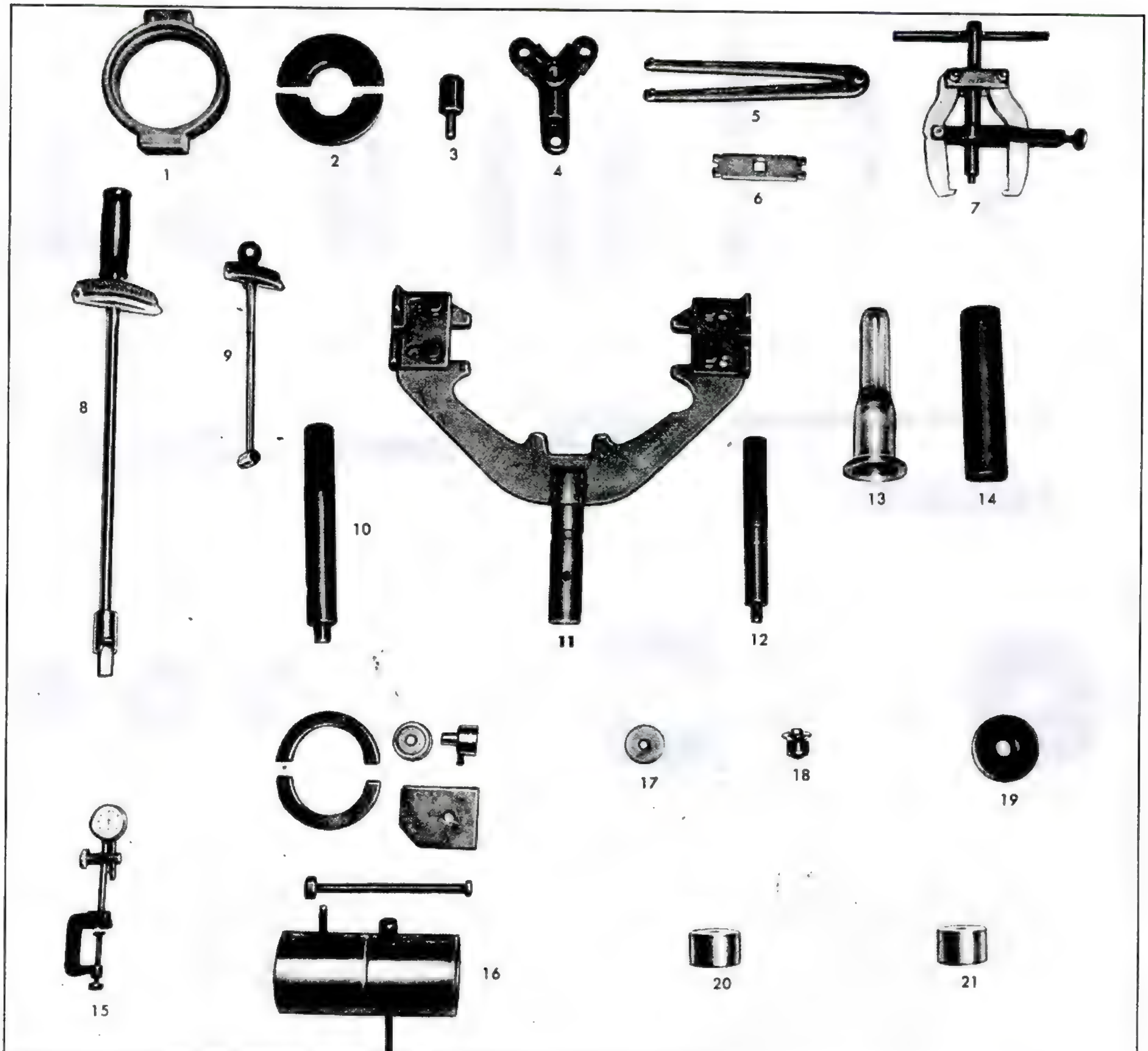


Fig. 84—Special Tools (Rear Axle)

1. J-0358-1 Pinion Bearing Remover Press Plate Holder
2. J-8331 Pinion Bearing Remover Plates—Used with J-0358-1 Holder
3. J-2619-4 Positraction Axle Torque Adapter
4. J-5748 Positraction Axle Torque Adapter Plate—Used with J-2619-4 Adapter
5. J-972 Pinion Adjusting Sleeve Wrench
6. J-8342 Differential Side Bearing Adjusting Sleeve Wrench
7. J-7112 Differential Side Bearing Puller
8. J-1313 0-150 ft. lbs. torque wrench
9. J-5853 0-50 in. lbs. torque wrench
10. J-8092 Driver Handle (threaded type)
11. J-3289 Differential Carrier Holding Fixture
12. J-7079-2 Driver Handle (insert type)
13. J-8340 Pinion Shaft Front Oil Seal Installer
14. J-5590 Pinion Shaft Bearing Installer
15. J-8001 Dial Indicator Set
16. J-6266 Pinion Setting Depth Gauge—Consists of J-6266-18 Adapters, J-6266-25 Plug, J-6266-19 Gauge, J-6266-5 Plate and J-6266-1 Cylinder
17. J-8107-2 Differential Side Bearing Puller Pilot Adapter
18. J-8362 Pinion Turning Adapter
19. J-7137 Pinion Rear Bearing Race—Installer Used with J-7079-2 Handle
20. J-8359 Differential Side Bearing Installer—Used with J-7079-2 Hdl.
21. J-8448-1 Pinion Shaft Rear Oil Seal Installer

SECTION 5

BRAKES

CONTENTS OF THIS SECTION

CORVAIR 10,000 SERIES

INDEX

GENERAL DESCRIPTION

The self-adjusting brakes used (fig. 1) on both front and rear of all models are the Duo-Servo single anchor type which utilize the momentum of the vehicle to assist in the brake application. This self-energizing or self-actuating force is applied to both brake shoes at each wheel in both forward or reverse motion. The brake shoe facings are bonded to the shoes.

Wheel cylinders (fig. 2) are the double piston type permitting even distribution of pressure to each brake shoe. To keep out dust and moisture, both ends of each wheel cylinder are sealed with a rubber boot. The wheel cylinders have no adjustments.

The main cylinder (fig. 3) consists of a piston which receives mechanical pressure from the brake pedal and transmits it through the brake lines as hydraulic pressure to the wheel cylinders. The filler cap is accessible from inside the trunk compartment.

The parking brake lever is located to the left of the steering column. A cable type linkage, directed over pulleys and routed through the tunnel, connects this lever to an equalizer at the under body forward of the transmission.

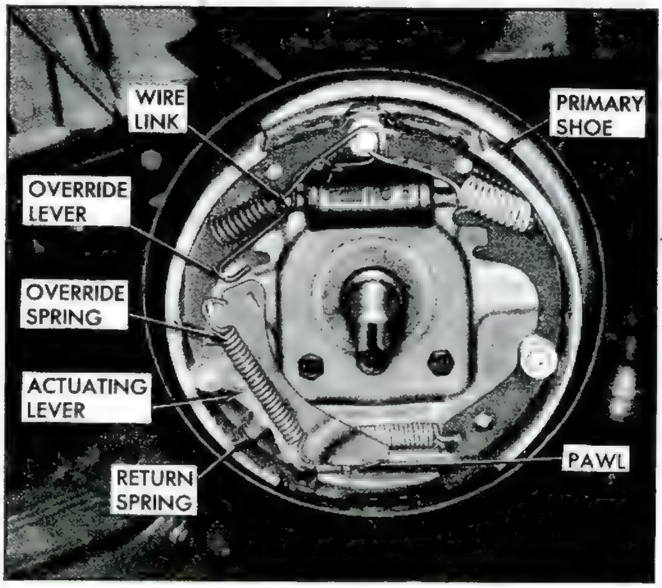


Fig. 1—Self-Adjusting Brakes

Force applied at the parking brake lever is transmitted to both right and left rear brakes by means of a single actuating cable which passes through the equalizer and is connected at each end to an actuating lever within the brake assembly.

The parking brake lever is of the single stroke ratchet type and incorporates a trigger release which is located in the lever grip. For correct adjustment procedure of service and parking brakes consult Maintenance and Adjustments in this section.

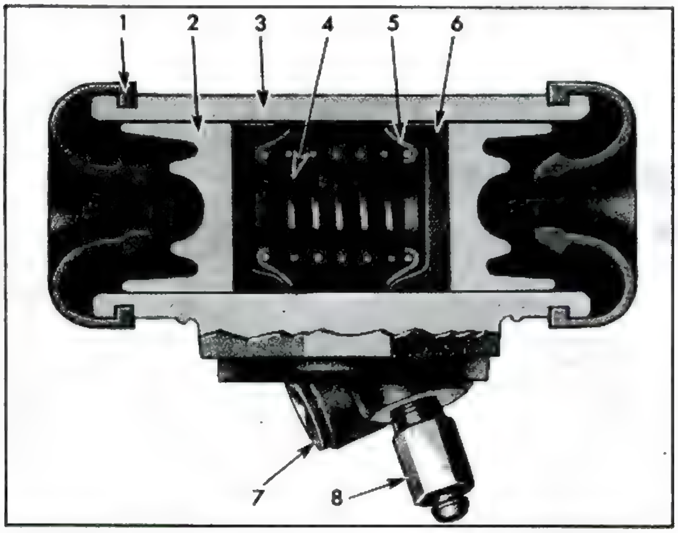


Fig. 2—Wheel Cylinder

1. Push Rod Boot
2. Piston
3. Housing
4. Spring
5. Piston Cup Expander
6. Piston Cup
7. Fluid Inlet
8. Bleeder Valve

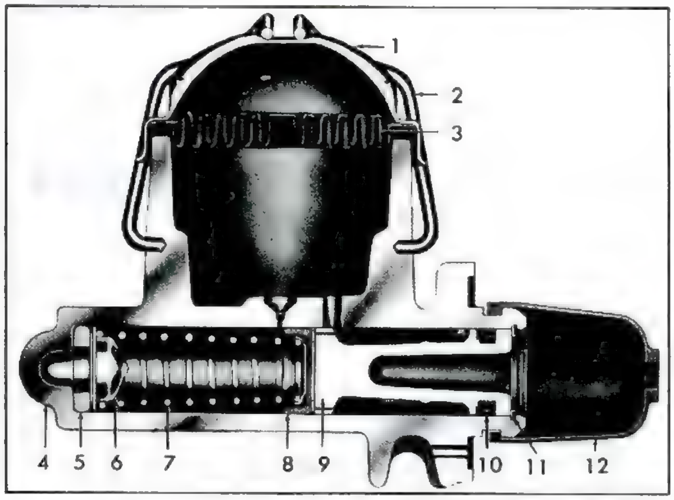


Fig. 3—Main Cylinder

1. Reservoir Cover
2. Bail Wire
3. Seal
4. Body
5. Valve Seat
6. Valve Assembly
7. Spring
8. Primary Cup
9. Piston
10. Secondary Cup
11. Lock Ring
12. Boot

MAINTENANCE AND ADJUSTMENTS

In any service operation it is extremely important that absolute cleanliness be observed. Any foreign matter in the hydraulic system will tend to clog the lines, ruin the rubber cups of the main and wheel cylinders and cause inefficient operation or even failure of the braking system. Dirt or grease on a brake lining may cause that brake to grab first on brake application and fade out on heavy brake application.

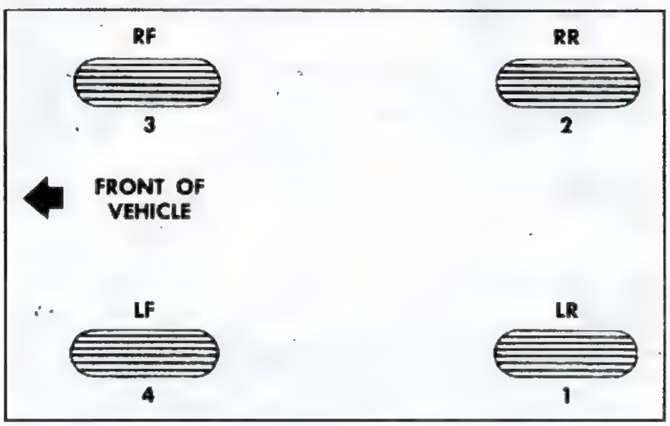


Fig. 4—Proper Bleeding Sequence

HYDRAULIC BRAKE FLUID

Only GM Hydraulic Brake Fluid Supreme No. 11 should be used when servicing brakes. This brake fluid is satisfactory for any climate and has all the qualities necessary for satisfactory operation, such as a high boiling point to prevent vapor lock and the ability to remain fluid at low temperatures.

In the event that improper fluid has entered the system, it will be necessary to:

1. Drain the entire system.
2. Thoroughly flush the system with clean alcohol, 188 proof, or a hydraulic system cleaning fluid, such as "Decelen."
3. Replace all rubber parts of the system including brake hoses.
4. Refill the system with GM Hydraulic Brake Fluid Supreme No. 11.

BLEEDING HYDRAULIC SYSTEM

The hydraulic brake system must be bled whenever any line has been disconnected or air has in some way entered the system. The system must be absolutely free of air at all times. Bleeding should be done on the longest line first and the proper sequence to follow is left rear, right rear, right front and left front (fig. 4). Bleeding of brake line may be accomplished by one of two methods: either pressure or manual.

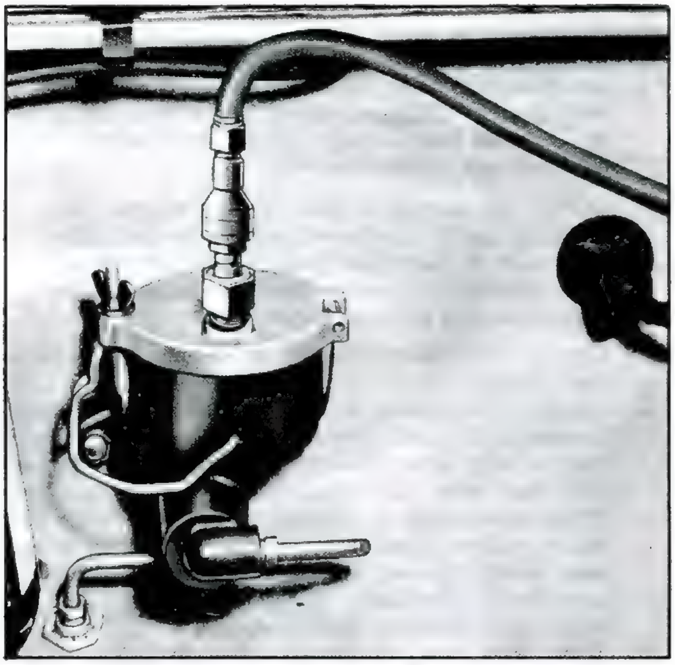


Fig. 5—Pressure Bleeding

Pressure Bleeding

NOTE: Place a suitable protective cover in the luggage compartment and over exterior portion of front fender panel to prevent possible damage by brake fluid and bleeder equipment.

1. Clean all dirt from top of main cylinder, and remove main cylinder cover.
2. Install Tool J-21479 (fig. 5), connect bleeder equipment to Tool J-21479, and open release valve on bleeder equipment.

   NOTE: Make sure brake fluid in bleeder equipment is at operating level and that the equipment is capable of exerting 30 to 50 lbs. hydraulic pressure on the brake system.

3. Position one end of bleeder hose on left rear wheel bleeder valve, and install Tool J-7647 on bleeder valve and hose.
4. Place loose end of bleeder hose in a transparent container. Pour a sufficient volume of brake fluid into container to ensure that end of bleeder hose will remain submerged.
5. Open wheel cylinder bleeder valve by turning Tool J-7647 counter-clockwise approximately 3/4 of a turn, and observe flow of fluid at end of bleeder hose.
6. Close bleeder valve tightly as soon as bubbles stop and brake fluid flows in a solid stream from the bleeder hose. Bleed off enough fluid to ensure that all fluid is replaced.
7. Remove Tool J-7647 and bleeder hose from wheel cylinder bleeder valve.
8. Repeat Steps 3 through 7 at the remaining wheel cylinders in the proper bleeding sequence. (See Figure 4).
9. Disconnect bleeder equipment, remove Tool J-21479, replace main cylinder cover, and remove protective cover from vehicle.

NOTE: The main cylinder bleeder adapter (Tool J-21479) is designed to allow filling of the reservoir to the proper level (1/4" from the reservoir rim) during the bleeding operation.-do not over-fill the reservoir.

Manual Bleeding

1. Clean all dirt from top of main cylinder and remove filler plug.
2. Fill main cylinder reservoir.
3. Remove bleeder valve dust cover. Install Tool J-7647 on bleeder hose and position one end of hose on bleeder valve, placing other end of hose in a transparent container holding sufficient fluid to cover end of hose.
4. Open bleeder valve by turning 3/4 of a turn in a counter-clockwise direction. Depress foot pedal. When pedal reaches floor close bleeder valve. Return pedal to brake released position with valve closed. Repeat this operation until air bubbles no longer appear in discharging fluid.
5. Close bleeder valve tightly as soon as fluid flows in a solid stream.
6. Remove bleeder hose and Tool J-7647.
7. Repeat operations 2 thru 6 at each wheel in the proper sequence (fig. 4).

   NOTE: Fill main cylinder reservoir to the proper level (1/4" from the reservoir rim).

PUSH ROD TO MAIN CYLINDER CLEARANCE

Brake pedal free movement is the upward movement of the brake pedal pad, with pedal in return position, before the pedal arm contacts the pedal stop. Since the pedal stop is permanently mounted and non-adjustable, it is essential that free movement be present--too much free

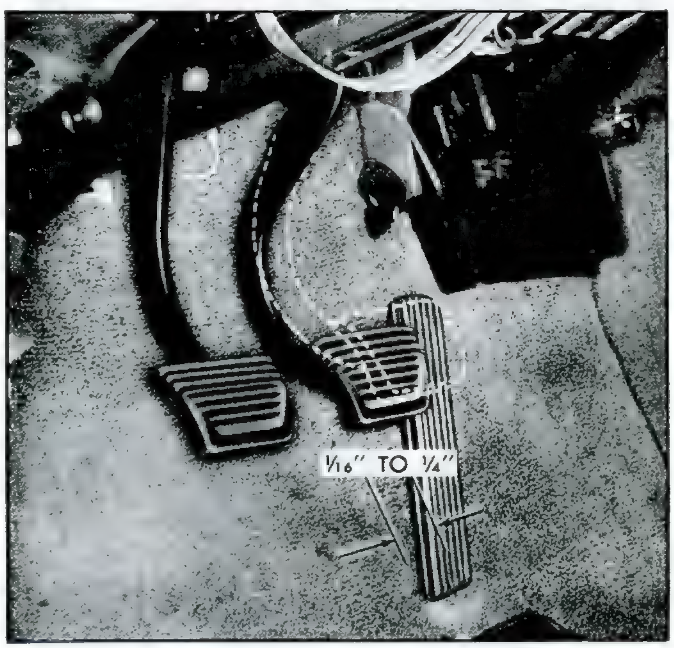


Fig. 6—Brake Pedal Free Movement

movement results in pedal rattle while insufficient movement will tend to force undue pressure on main cylinder piston, which would possibly close compensating port.

1. Loosen check nut on push rod sufficiently to allow adjustment.
2. Turn push rod in proper direction to obtain correct adjustment. Upward movement of the pedal pad before the pedal arm contacts the pedal stop must be 1/16 to 1/4 inch (fig. 6).
3. Tighten check nut against clevis, and recheck free movement.

HYDRAULIC BRAKE LINES

Hydraulic Brake Hose

The flexible hoses which carry the hydraulic pressure from the steel lines to the wheel cylinders are carefully designed and constructed to withstand all conditions of stress and twist which they encounter during normal vehicle usage.

The hoses require no service other than periodic inspection for damage from road hazards or other like sources. Should damage occur and replacement become necessary, the following procedure is to be followed.

Removal

1. Separate hose from steel line by turning double flare connector out of hose fitting.
2. Remove "U" shaped retainer from hose fitting and withdraw hose from support bracket.
3. Turn hose fitting out of wheel cylinder inlet.

Installation

1. Install new copper gasket on cylinder end of hose (male end)
2. Moisten threads with brake fluid and install hose in wheel cylinder inlet.

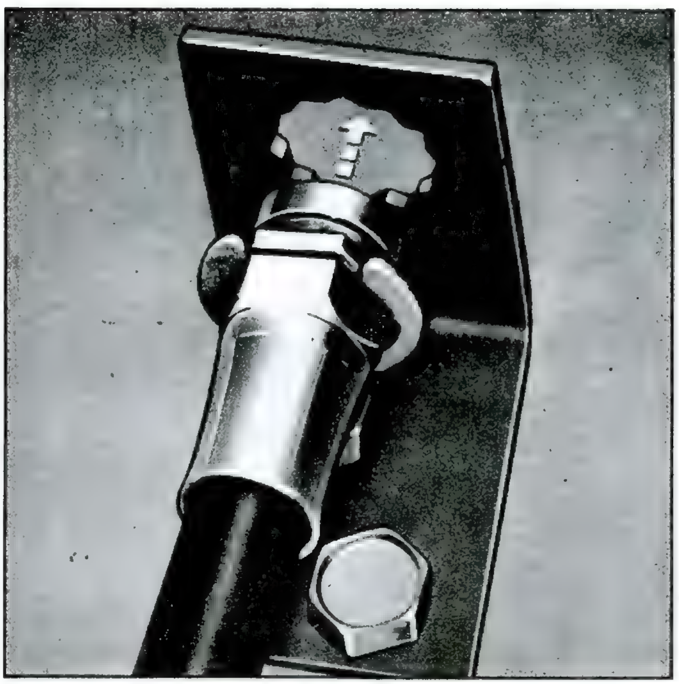


Fig. 7—Brake Line Support Bracket

3. With weight of car on wheel and suspension in normal position (front wheels straight ahead) pass female end of hose through support bracket, allowing hose to seek its own position. Insert hex of hose fitting into the 12 point hole in support bracket in position which induces least twist to hose (fig. 7).

   NOTE: Do not twist hose unduly during this operation as its natural curvature is absolutely necessary to maintain proper hose-to-suspension clearance through full movement of the suspension and steering parts.

4. Install "U" shaped retainer to secure hose in support bracket.
5. Inspect by removing weight completely from wheel; if working at front wheels turn steering linkage from lock to lock while observing hose position. Be sure that hose does not touch other parts at any time during suspension or linkage travel. If contact does occur remove hose retainer and rotate the female hose end in the support bracket one or two points in appropriate direction, replace retainer, and re-inspect as outlined in this paragraph.
6. Place steel tube connector in hose fitting and tighten securely.
7. Bleed all brakes as outlined in this section.

Hydraulic Brake Tubing

Hydraulic brake tubing is a double layer annealed steel, copper coated and tin plated 3/16" tubing which resists corrosion and has the physical strength to stand up under the high pressures which are developed when applying the brakes. In making up hydraulic brake pipes, it is important that the proper flaring tool be used to flare the ends of the tubing for the compression couplings. Unless the tubing is properly flared, the connections will leak and the brakes will become ineffective.

CAUTION: When necessary to replace brake tubing, always use special metal tubing which is designed to withstand high pressure and resist corrosion. Ordinary copper tubing is not satisfactory and should not be used.

This safety steel tubing must be double-lap flared at the ends in order to produce a strong leak-proof joint.

The brake tube flaring Tool J-8051 (fig. 8) is used to form the double-lap flare.

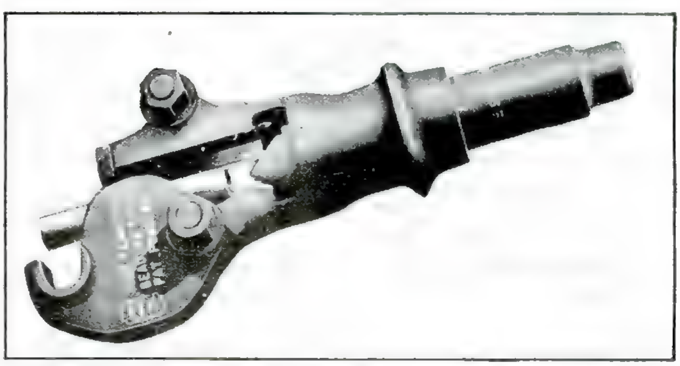


Fig. 8—Hydraulic Brake Tube Double Flaring Tool

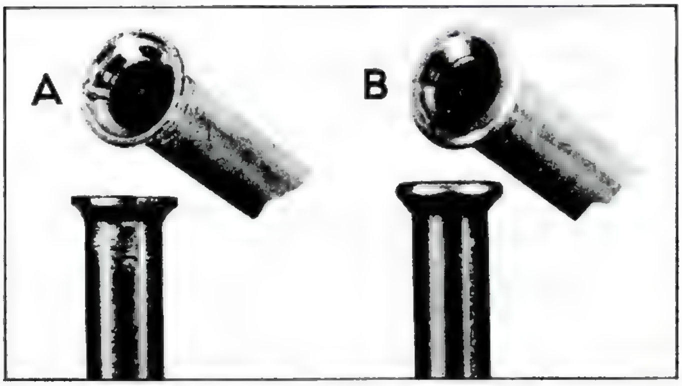


Fig. 9—Single and Double Lap Flaring

Figure 9 shows two pieces of tubing, one with single-lap flare "A" and the other with double-lap flare "B". It will be noted that the single-lap flare in "A" split the tubing while the one shown in "B" is well-formed and unbroken due to the reinforcement of the double wall.

The following procedure should be followed making up hydraulic brake pipes.

Double Lap Flaring

1. Clamp the tubing in the proper size die blocks with the flat ends of the blocks toward the end of the tubing to be cut off. Cut the end of the tubing flush and square. Using a mill file, dress tubing and square ends.
2. Remove the tubing from the die block and deburr the inside and outside edges.
3. Install compression couplings on tubing and dip end of tubing to be flared in hydraulic fluid. This lubrication results in better formation of the flare.
4. Place one-half of the die blocks in the tool body with the counterbored ends toward the ram guide. Now lay the tubing in the block with approximately 1/2" protruding beyond the end. Fit the other half of the block into the tool body, close the latch plate and tighten the nuts "finger-tight."
5. Select the correct size upset flare punch. One end of this punch is counterbored or hollowed out to gauge the amount of tubing necessary to form a double lap flare. Slip the punch into the tool body with the gauge end toward the die blocks. Install the ram; then tap lightly until the punch meets the die blocks and they are forced securely against the stop plate (fig. 10).
6. Using the supplied wrench, draw the latch plate nuts down tight to prevent the tube from slipping. Tightening the nuts alternately (beginning with the nut at the closed hole in the plate) will prevent distortion of the plate. Remove the punch and the ram. Now reverse the punch and put it back into the tool body. Install the ram and tap it lightly until the face of the upset flare punch contacts the face of the die blocks (fig. 11). This completes the first operation. Remove the ram and the punch.
7. To complete the flare, insert the pointed finish flare punch and the ram into the tool body. Tap the ram until a good seat is formed (fig. 12).

NOTE: The seat should be inspected at intervals during the finishing operation to avoid overseating.

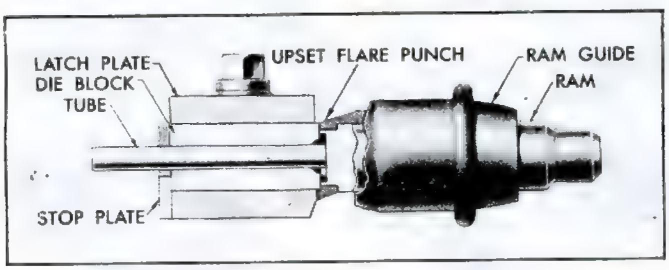


Fig. 10—Flaring Operation—Positioning Tubing

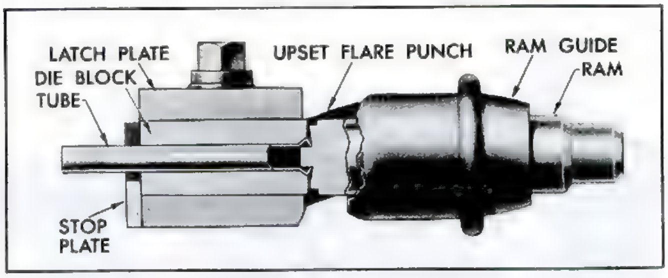


Fig. 11—Flaring Operation—First Flare

SERVICE BRAKE ADJUSTMENT

Although the brakes are self-adjusting, a preliminary or initial adjustment may be necessary after the brakes have been relined or replaced, or whenever the length of the adjusting screw has been changed. The final adjustment is made by using the self-adjusting feature.

1. With brake drum off, disengage the actuator from the star wheel and rotate the star wheel by spinning or turning with a small screw driver.
2. **Recommended:**
   a. Use special Tool J-21177, Drum-to-Brake Shoe Clearance Gauge, to check the diameter of the drum inner surface (fig. 13).

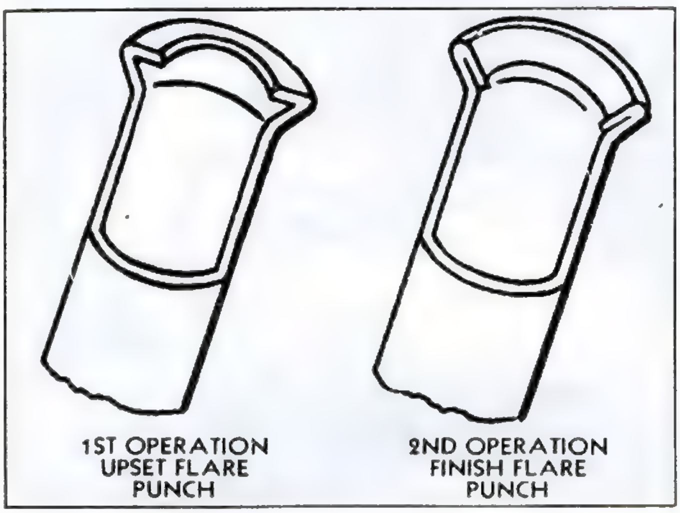


Fig. 12—Flaring Operation—First and Second Flare

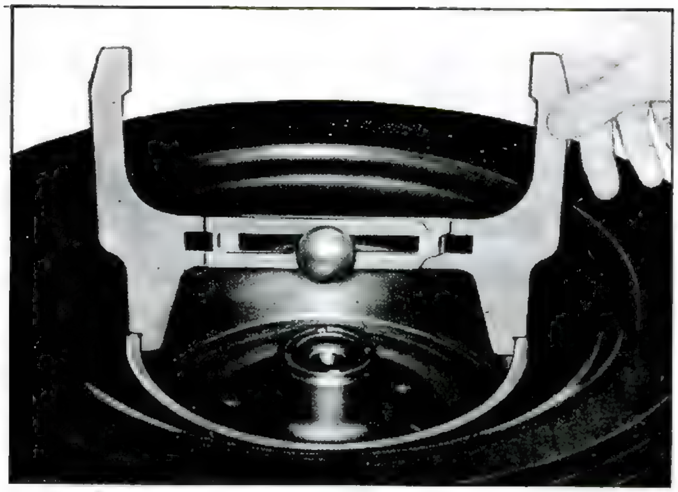


Fig. 13—Using Drum-to-Brake Shoe Clearance Gauge

b. Turn the tool to the opposite side and fit over the brake shoes by turning the star wheel until the gauge just slides over the linings (fig. 14).

c. Rotate the gauge around the brake shoe lining surface to assure proper clearance.

Alternate:

a. Using the brake drum as an adjustment fixture, turn the star wheel until the drum slides over the brake shoes with a slight drag.

b. Turn the star wheel 1-1/4 turns to retract the shoes. This will allow sufficient lining-to-drum clearance so final adjustment may be made as described in Step 4.

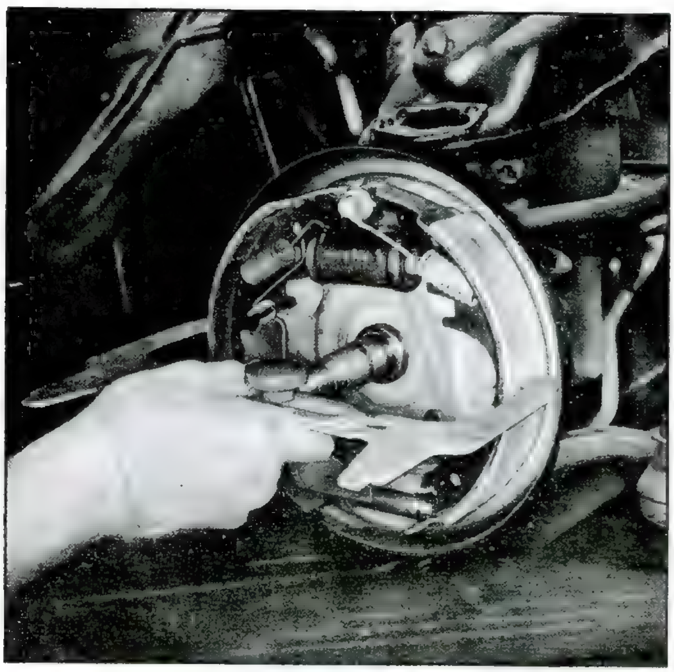


Fig. 14—Checking Brake Shoe Lining Clearance

3. Install the drum and wheel.

   NOTE: 1: If lanced area in brake drum was knocked out, be sure all metal has been removed from brake compartment. Install new hole cover in drum to prevent contamination of the brakes.

   NOTE: 2: Make certain when installing drums that drums are installed in the same position as when removed with the drum locating tang in line with the locating hole in the axle shaft (fig. 15).

4. Make final adjustment by making numerous forward and reverse stops, applying brakes with a firm pedal effort until a satisfactory brake pedal height results.

   NOTE: Frequent usage of an automatic transmission forward range to halt reverse vehicle motion may prevent the automatic adjusters from functioning, thereby inducing low pedal heights.

PARKING BRAKE

The service brake must be properly adjusted first as a base for the parking brake adjustment.

Adjustment

1. Jack up both rear wheels.
2. Pull parking brake lever up 1 notch from fully released position.
3. Loosen the forward check nut on the equalizer and tighten the rear one until a heavy drag is felt when rear wheels are rotated.
4. Tighten check nuts securely.
5. Fully release parking brake and rotate rear wheels; no drag should be present.

Fig. 15—Aligning Drum Tang with Wheel Hub

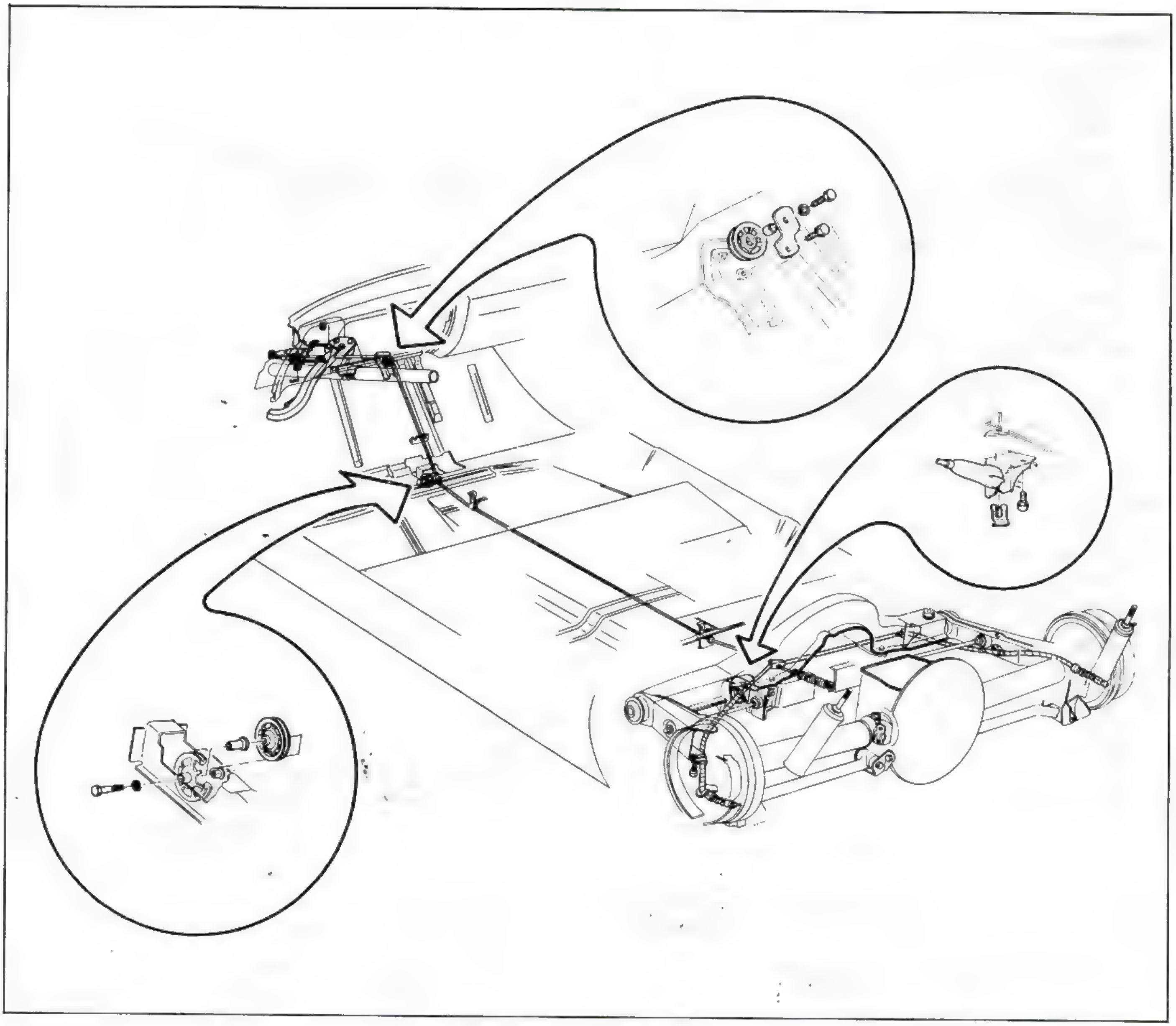


Fig. 16—Parking Brake System

Inspection

If complete release of the parking brake is not obtained when release handle is pulled, or if application effort is high, check parking brake lever assembly for free operation. If operation is sticky or a bind is experienced, correct as follows:

1. Clean and lubricate brake cables and pulleys.

   NOTE: These pulleys must be lubricated, as outlined in Section 2, every 12,000 miles.

2. Inspect brake lever assembly for straightness and alignment (replace if necessary).
3. Clean and lubricate parking brake lever assembly, which must operate freely.
4. Check condition and installation of return spring.

SERVICE OPERATIONS

FORWARD PARKING BRAKE CABLE

Removal

NOTE: Remove positive cable from battery to eliminate possibility of creating short circuits under dash.

1. Release parking brake.
2. Remove equalizer check nuts and separate cable stud from equalizer.
3. Remove underbody tunnel cover.
4. Remove toe pan tunnel cover.
5. Remove cable pulley from upper toe board bracket.
6. Remove cable ball from hand lever clevis and withdraw cable from car.

Installation

1. Thread cable through all pulley brackets, guides, and rear tunnel wall.
2. Lubricate cable ball and position in hand lever clevis.
3. Lubricate and reinstall pulley, carefully positioning cable in pulley groove.
4. Place one check nut on cable stud and insert into equalizer, then place second nut on stud.
5. Replace toe pan tunnel cover and underbody tunnel cover.

   NOTE: Attach toe pan cover with original length screws only; longer screws may puncture fuel tank.

6. Replace positive battery cable.
7. Continue as outlined under Parking Brake--Adjustment.

REAR PARKING BRAKE CABLE ASSEMBLY

Removal

1. Release parking brake.
2. Remove return spring.
3. Remove rear equalizer check nut and separate forward cable stud from equalizer.
4. Extract "U" clips and cable from support brackets which are bolted to rear crossmember.
5. Remove bolt holding cable clip to control arm.
6. Remove rear wheels and brake drums.
7. Pry actuating lever from behind secondary brake shoe with screw driver, then separate cable tip from actuating lever by compressing retaining spring and lifting cable tip up and out of "U" shaped junction in lever.
8. Compress expanded conduit locking fingers at the flange plate entry hole and withdraw cable.

Installation

1. Pass end of cable and conduit tip through flange plate entry hole, making sure that conduit locking fingers all expand fully.
2. Compress retaining spring and position cable in "U" shaped actuating lever junction.
3. Replace brake drum and wheel.
4. Position cable clip to control arm and secure with attaching bolt.
5. Pass die cast conduit tip through support bracket and secure with "U" clip.
6. Position rubber boot over conduit tip, carefully indexing bead of boot in groove provided in tip casting.
7. Place equalizer on cable and insert forward cable stud. Install check nut and return spring.

   NOTE: To perform its intended function, equalizer must be free to slide on rear cable. Lubricate with chassis grease on assembly and every 5,000 miles thereafter.

8. Proceed as outlined under Parking Brake--Adjustment.

BRAKE PEDAL

Removal

1. Remove pedal stop and stop light switch from pedal support bracket, also remove clutch pull back spring.
2. Loosen check nut on main cylinder push rod, and adjust push rod so that maximum clearance is obtained between push rod and piston.
3. Remove nut and lock washer from clutch pedal cross shaft and remove clutch pedal, then remove support bolt, lock washer and special washer.

   NOTE: On Powerglide models remove and discard the retainer clip from the pedal pivot shaft.

4. Remove pedal pivot shaft, and withdraw pedal, push rod and clevis from support and rubber boot.
5. Remove clevis, push rod, pedal pad and shaft bushings from pedal assembly. Also remove bushing from support.

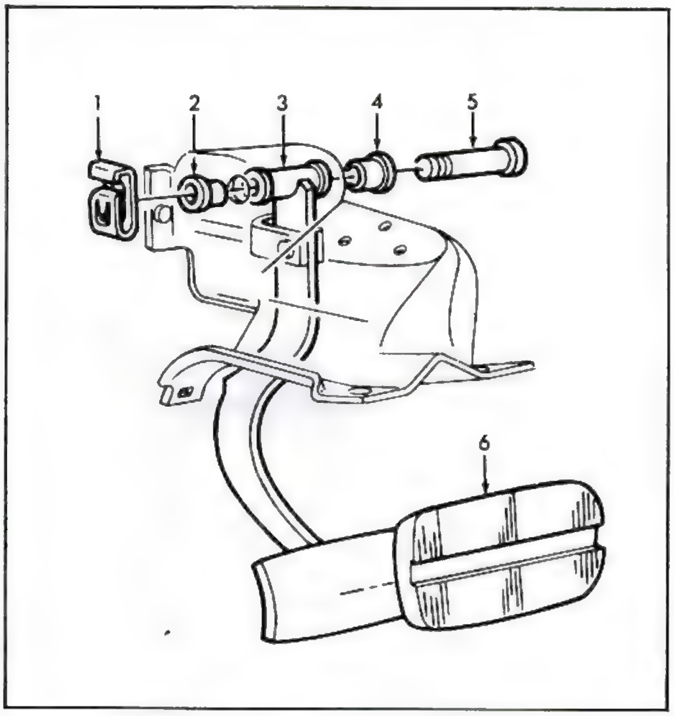


Fig. 17—Brake Pedal and Attachments—w/Automatic Trans.

1. Retaining Clip
2. Bushing
3. Pedal
4. Bushing
5. Pedal Pivot Shaft
6. Pedal Pad

Inspection

1. Clean all metal parts with a nontoxic cleaning solvent.
2. Wipe the nylon bushings clean with a clean cloth.

   CAUTION: Nylon bushings should not be treated with cleansing agent of any nature.

3. Inspect pivot pin and nylon bushings for wear and damage--replace parts as required.

Installation

1. Apply a light coating of Lubriplate to inside diameter of nylon bushings and install bushings to pedal bore and support.
2. Position push rod and clevis to pedal arm, and install clevis pin and retainer.

   CAUTION: Install clevis pin from right side of pedal arm, for proper operating clearances and retention.

3. Apply rubber lube to push rod surface. Position complete pedal assembly to support and insert push rod through rubber boot. Install clutch pedal cross shaft from right side so that shaft goes through support assembly, pedal and bushings. Secure by installing support bolt with lock washer and special washer.

   NOTE: On Powerglide models install pedal pivot pin from left side so that pin goes through support assembly and pedal bushings. Hold head of pivot pin securely against support, and install a new push-on type retainer. There should be no end play in pin after retainer is installed. (Install retainer so that flush side is snug against support.)

4. Install clutch pedal secure with lock washer and nut and torque to 30-35 ft. lbs.
5. Install pedal stop and stop light switch, and adjust brake pedal free play (see "Push Rod to Main Cylinder Clearance"). Also install clutch pull back spring.

SHOES AND LININGS

NOTE: If brake drums are worn severely, it may be necessary to retract the adjusting screw. To gain access to the adjusting screw star wheel, knock out the lanced area in the web of the brake drum using a chisel or similar tool. Release the actuator from the star wheel by lifting with a small screw driver and back off the star wheel with a second screw driver (press down on handle to retract shoes).

CAUTION: After knocking out the metal, be sure to remove it from the inside of the drum and clean all metal from the brake compartment. A new hole cover must be installed when drum is reinstalled.

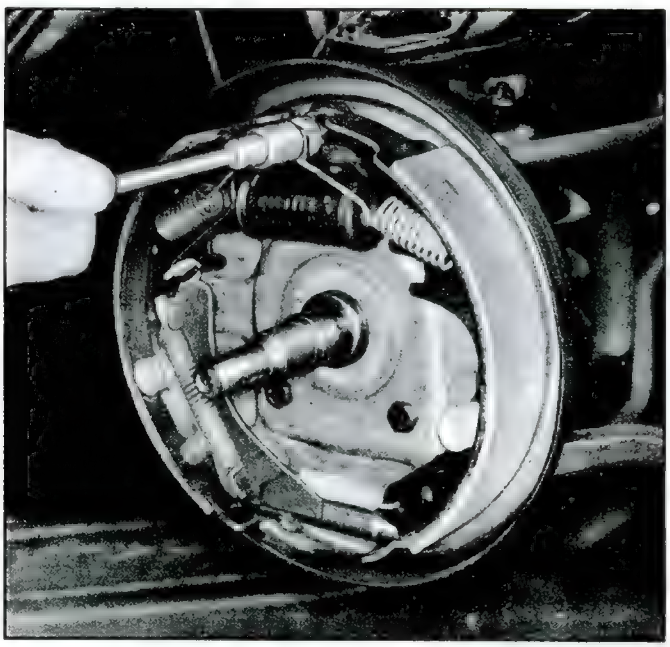


Fig. 18—Unhooking Pull Back Springs

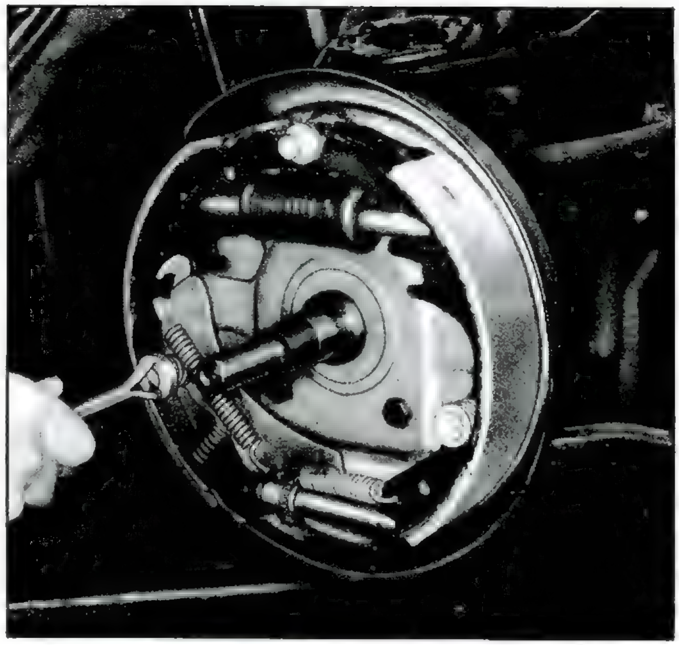


Fig. 19—Removing Hold Down Springs and Pins

Removal

1. Raise the vehicle and place on stand jacks.
2. Loosen check nuts at forward end of parking brake cable sufficiently to remove all tension from brake cable.
3. Remove brake drum.

   NOTE: Since boots are recessed in grooves on wheel cylinders to prevent pistons from leaving cylinders, it is not necessary to install wheel cylinder clamps when brake shoes are removed; however, brake pedal must not be depressed while drums are removed.

4. Unhook brake shoe pull back springs from anchor pin and link end, using Tool J-8049 (fig. 18).
5. Remove the actuator return spring.
6. Disengage the link end from the anchor pin and then from the secondary shoe.
7. Remove hold-down pins and springs using a pair of needle nose pliers (fig. 19).
8. Remove the actuator assembly.

   NOTE: The actuator, pivot and override spring are on assembly. It is not recommended that they be disassembled for service purpose, unless they are broken. It is much easier to assemble and disassemble the brakes by leaving them intact.

9. Separate the brake shoes by removing adjusting screw and spring.
10. Remove parking brake lever from secondary brake shoe (rear only).
11. Clean dirt out of brake drum using care to avoid getting dirt into front wheel bearings. Inspect drums for roughness, scoring or out-of-round. Replace or recondition drums as necessary.
12. Inspect wheel bearings and oil seal and replace any necessary parts.
13. Carefully pull lower edges of wheel cylinder boots

away from cylinders and note whether interior is wet with brake fluid. Excessive fluid at this point indicates leakage past piston cups requiring overhaul of wheel cylinder.

NOTE: A slight amount of fluid is nearly always present and acts as lubricant for the piston.

14. If working at rear wheels, inspect backing plate for grease leakage past axle shaft seals. Install new seals if necessary.
15. Check all brake flange plate attaching bolts to make sure they are tight. Clean all rust and dirt from shoe contact faces on flange plate, using fine emery cloth.

Instr tion

CAUTION: Make certain to install recommended shoe and lining assemblies, otherwise serious fade or permanent failure may occur.

1. Inspect new linings and make certain there are no nicks or burrs on bonding material on shoe edge where contact is made with brake flange plate or on any of the contact surfaces.

NOTE: Keep hands clean while handling brake shoes. Do not permit oil or grease to come in contact with linings.

2. If working on rear brakes, lubricate parking brake cable.
3. On rear brakes only, lubricate fulcrum end of parking brake lever and the bolt with brake lube, then attach lever to secondary shoe, with bolt, spring washer, lock washer and nut. Make sure that lever moves freely.
4. Before installation, make certain the adjusting screw is clean and lubricated properly.

NOTE: Loose adjustment may occur from an adjusting screw that is not properly operating. If the lubrication in the adjusting screw assembly is contaminated or destroyed, the adjusting screw should be thoroughly cleaned and lubricated.

5. Connect brake shoes together with adjusting screw spring, then place adjusting screw, socket and nut in position.

CAUTION: Make sure the proper adjusting screw is used (screw stamped "L" for left side of vehicle and "R" for right side of vehicle). The star wheel should only be installed with the star wheel nearest to the secondary shoe and the adjusting screw spring inserted properly to prevent interference with the star wheel.

6. Secure the primary brake shoe (short lining--faces forward) first with the hold-down pin and spring using a pair of needle nose pliers. Engage shoes with the wheel cylinder connecting links.
7. Secure the actuator assembly, override spring and return spring on the secondary shoe.
8. Install and secure the actuator assembly and secondary brake shoe with the hold-down pin and spring using a pair of needle nose pliers.
9. Install guide plate over anchor pin.
10. Install the wire link.

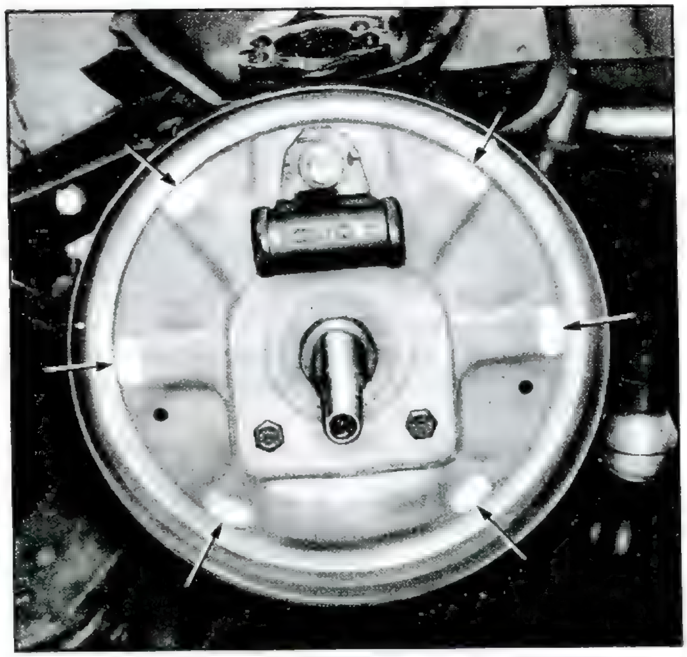


Fig. 20—Backing Plate Contact Surfaces

NOTE: Do not hook the wire link over the anchor pin stud with the regular spring hook tool. This may damage the cylinder boot seals. Place the wire link over the anchor pin stud first, and then fasten to the actuator assembly by holding the adjuster assembly in the full down position.

11. On rear brakes connect to parking brake lever and install strut between lever and primary shoe as installation is made.
12. If old brake pull back (return) springs are nicked,

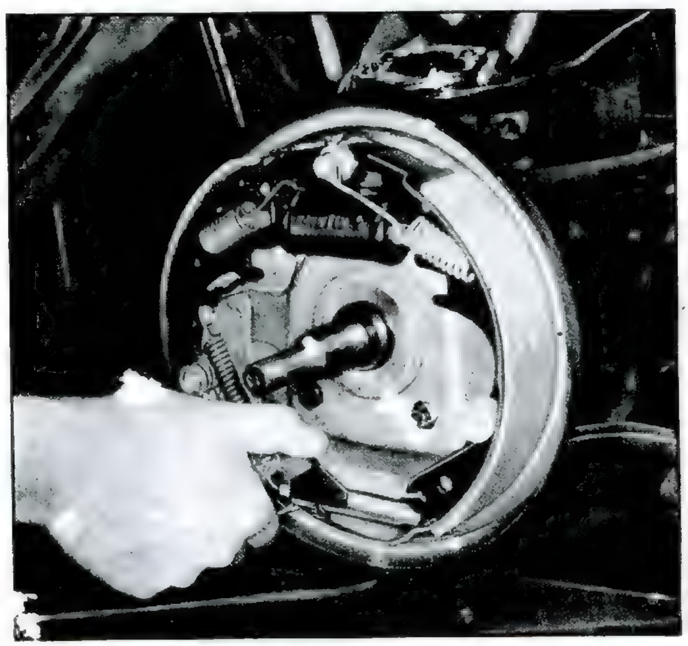


Fig. 21—Checking Operation of the Actuating Lever

distorted, or if strength is doubtful, install new springs.

13. Hook springs in shoes using Tool J-8049 by installing the primary spring from the shoe over the anchor pin and then spring from secondary shoe over the wire link end.
14. Pry shoes away from backing plate and lubricate shoe contact surfaces with a thin coating of brake lubs (fig. 20).

    CAUTION: Be careful to keep lubricant off facings.

15. After completing installation, make certain the actuator lever functions easily by hand operating the self-adjusting feature (fig. 21).
16. Follow the above procedure for all brakes.
17. Adjust the service brakes as outlined below, then adjust the parking brake.

MAIN CYLINDER

Removal

1. Provide suitable protective cover for luggage compartment and exterior portion of front fender panel.
2. Disconnect hydraulic line from outlet end of cylinder and tee.
3. Remove the two retaining nuts and lock washers from the cylinder mounting studs, and remove the cylinder, gasket, and rubber boot from the vehicle.

Disassembly

1. Remove boot from main cylinder.
2. Place main cylinder in a vise so that the lock ring (fig. 22) can be removed from the small groove in the I.D. of bore.

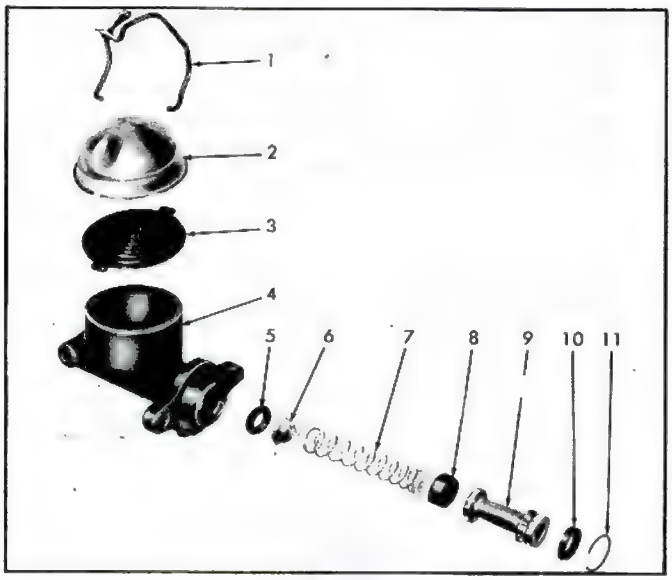


Fig. 22—Brake Main Cylinder

1. Bail Wire
2. Reservoir Cover
3. Seal
4. Body
5. Valve Seat
6. Valve Assembly
7. Spring
8. Primary Cup
9. Piston
10. Secondary Cup
11. Lock Ring

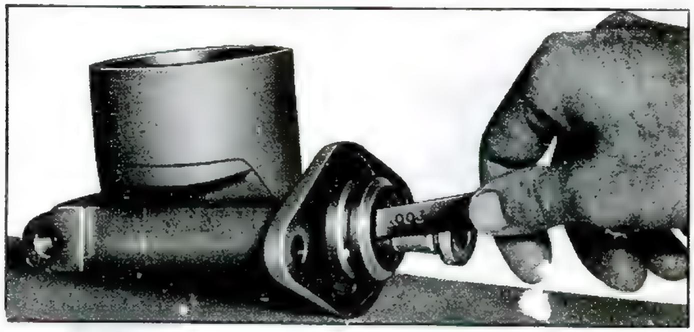


Fig. 23—Checking Main Cylinder Piston Fit

3. Remove lock ring, main cylinder piston assembly, primary cup, spring and valve assembly and valve seat from cylinder bore.
4. Pry ball wire off cover with screw driver or similar tool and remove cover and seal.

Inspection

1. Wash all parts in clean alcohol. Make sure that compensating and bypass ports in main cylinder body and bypass holes in piston are clean and open.

    NOTE: Before washing parts, hands must be clean. Do not wash hands in gasoline or oil before cleaning parts. Use soap and water to clean hands.

2. Inspect cylinder bore for corrosion, pits and foreign matter.
3. Inspect primary and secondary cups, check valve and valve seat for damage and swelling. Swelling of rubber parts is due to the use of improper brake fluid or washing parts in gasoline or kerosene.
4. Check piston fit in cylinder bore (fig. 23). The clearance between piston and wall of cylinder should be 0.001-0.005 inch.

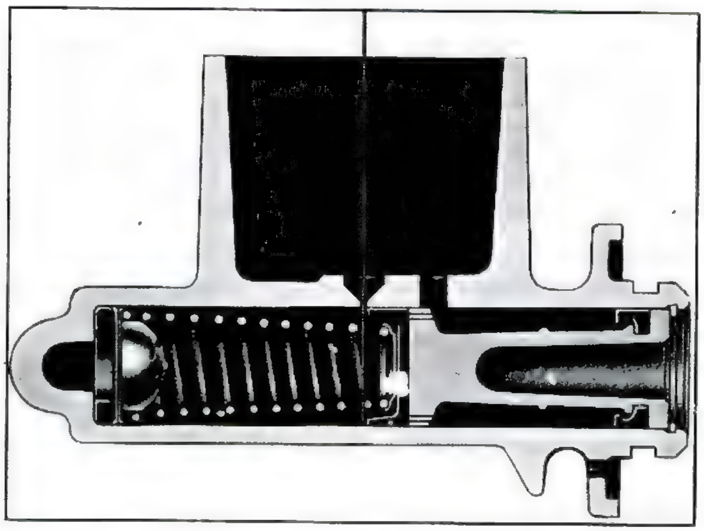


Fig. 24—Checking Compensating Port Clearance

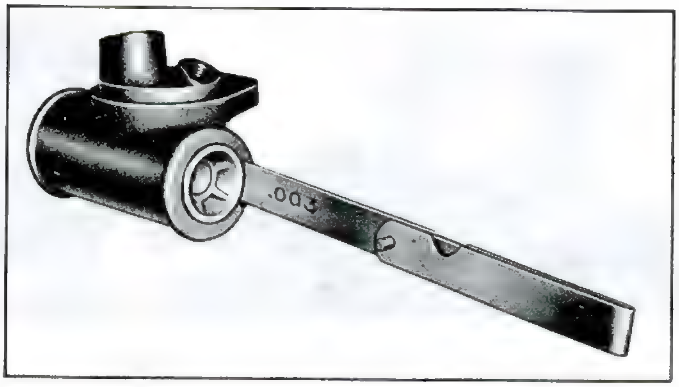


Fig. 25—Checking Wheel Cylinder Piston Fit

Assembly

Whenever a hydraulic brake main cylinder is overhauled, care must be taken to reassemble the check valve correctly. Improper assembly of the check valve seat will result in its distortion. When the check valve seat is distorted, there will be no check valve action and there will be a loss of brake pedal travel, also, the pedal will have to be depressed or pumped one or more times before actual car braking occurs.

1. Install valve seat in cylinder bore so that flat portion of seat rests against end of cylinder bore.
2. Position valve and spring assembly into bore.
3. Dip primary cup into clean brake fluid and install into main cylinder with the flat side toward push rod end. Make sure cup seats over end of spring.
4. Assemble the secondary seal in the groove on the piston so that the lip faces toward the end of the piston that contains the bypass holes.
5. Dip piston in clean brake fluid and place piston in cylinder bore.
6. Install piston stop ring.
7. Check clearance between the edge of the primary cup and the center of compensating port.

   NOTE: This check is made easily by using a wire and inserting it through the reservoir and into piston chamber (fig. 24).

8. Install a new seal in cover and place cover on cylinder. Secure by snapping bail wire in place.
9. Install rubber boot, making certain boot seals tightly on cylinder body. This seal must be maintained to keep water and other foreign matter from entering the main cylinder.
10. Install mounting gasket to main cylinder.

Installation

1. Position main cylinder on mounting studs and secure to dash wall. Make sure push rod goes through rubber boot and into piston.
2. Connect brake line to main cylinder.
3. Check, and if necessary, adjust brake pedal free play.
4. Bleed brakes as outlined in this section.

WHEEL CYLINDER

Removal

1. Raise vehicle and place on jack stand.
2. Remove wheel and tire assembly, back off brake adjustment (only if necessary) and remove drum.
3. Disconnect brake system hydraulic line from cylinder.
4. Remove brake shoe pull back springs.
5. Remove two cap screws that hold wheel cylinder to flange plate, disengage wheel cylinder push rods from brake shoes, and remove wheel cylinder.

Disassembly

1. Remove the cylinder boots.
2. Remove the pistons, rubber cups and spring.
3. Wash all parts in clean alcohol.

   NOTE: Before washing parts, hands must be clean. Do not wash hands in gasoline or fuel oil before cleaning parts. Use soap and water to clean hands.

Inspection

1. Inspect cylinder bore for smoothness. A scored or damaged cylinder must be replaced.
2. Check rubber cups for damage or swelling. Replace the cups when necessary. Improper brake fluid will cause the cups to swell as much as 40 per cent.
3. Check fit of the piston in the cylinder bore, using a feeler gauge (fig. 25). This clearance should be from .002"-.004". If clearance exceeds .004", replace cylinder.

Assembly (Fig. 26)

1. Moisten cylinder bore, pistons and rubber cups with brake fluid before assembly.
2. Place a boot over one end of cylinder.
3. Insert a piston with flat side toward open end of cylinder.
4. Insert a rubber cup with flat side against piston.
5. Insert spring with expanders securely connected and follow with remaining parts in the reverse order of foregoing assembly procedure.

Installation

1. Position wheel cylinder to brake flange plate, install cap screws and tighten securely.
2. Replace all push rods and pull back springs.
3. Connect hose or line to wheel cylinder.

   NOTE: If replacing front wheel cylinder, connect hose and inspect installation as outlined in "Hydraulic Brake Hose Replacement."

Fig. 26—Wheel Cylinder

1. Push Rod Boot
2. Piston
3. Piston Cup
4. Piston Cup Expander
5. Housing
6. Bleeder Valve
7. Spring

4. Install drum and wheel.
5. Bleed brakes as specified in this section.

BRAKE DRUMS

Front brake drums are the demountable type; that is, they can be removed without removing the hub. Rear brake drums are demountable and may be removed without removing the axle shaft.

A lanced "knock out" area (fig. 27) is provided in the web of the brake drum for servicing purposes in the event retracting of the brake shoes is required in order to remove the drum.

> **NOTE:** If brake drums are worn severely, it may be necessary to retract the adjusting screw. To gain access to the adjusting screw star wheel, knock out the lanced area in the web of the brake drum using a chisel or similar tool. Release the actuator from the star wheel by lifting with a small screw driver and back off the [illegible] wheel with the second screw driver (press down on the handle to retract shoes).
>
> **CAUTION:** After knocking out the metal, be sure to remove it from the inside of the drum and clean all metal from the brake compartment. A new hole cover must be installed when drum is reinstalled.

Removal

1. Raise vehicle and place on jack stand.
2. Remove wheel and tire assembly, back off brake adjustment and remove drum.

Inspecting and Reconditioning

Whenever brake drums are removed they should be thoroughly cleaned and inspected for cracks, scores, deep grooves, and out-of-round. Any of these conditions must be corrected since they can impair the efficiency of brake operation and also can cause premature failure of other parts.

Smooth up any slight scores by polishing with fine emery cloth. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to rebore in order to true up the braking surface.

An out-of-round drum makes accurate brake shoe adjustment impossible and is likely to cause excessive wear of other parts of brake mechanism due to its eccentric action.

A drum that is more than .008" out-of-round on the diameter is unfit for service and should be rebored. Out-of-round, as well as taper and wear can be accurately measured with an inside micrometer fitted with proper extension rods.

If drum is to be rebored for use with standard size brake facings which are worn very little, only enough metal should be removed to obtain a true smooth braking surface.

If drum has to be rebored more than .020" over the standard diameter, it should be rebored to .060" diameter oversize and the brake facing should be replaced with .030" oversize facings.

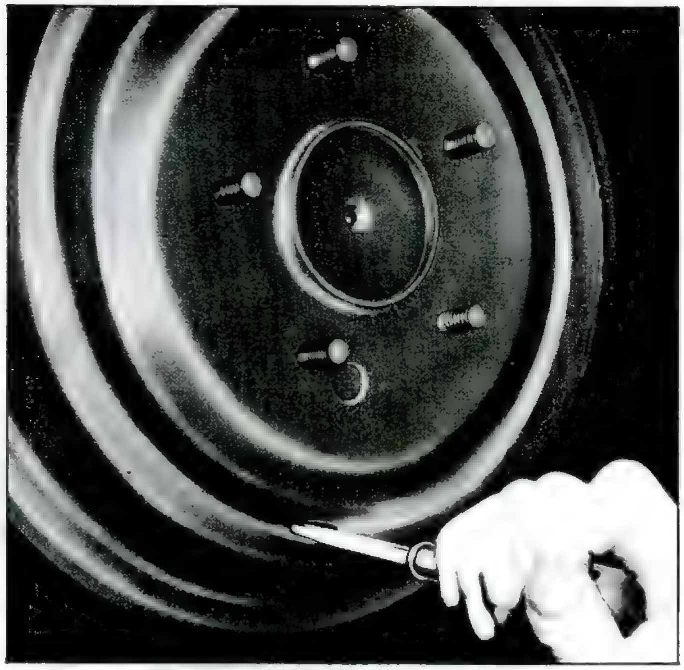


Fig. 27—Brake Drum Access Hole

A brake drum must not be rebored more than .060" over the maximum standard diameter, since removal of more metal will effect dissipation of heat and may cause distortion of drum. Chevrolet brake facing is not furnished larger than .030" oversize and this will not work efficiently in drums bored more than .060" oversize.

Brake drums may be finished either by turning or grinding. Best brake performance is obtained by turning drums with a very fine feed. To insure maximum lining life, the refinished braking surface must be smooth and free from chatter or tool marks, and run-out must not exceed .005" total indicator reading.

Cleaning

New brake drums in parts stock are given a light coating of rust proofing oil to prevent the formation of rust on the critical braking surfaces during the time that the drums are in storage.

This rust proofing oil must be carefully removed before the drum is placed in service to prevent any of this oil from getting on the brake shoe facings, which might cause an extreme brake grab condition.

It is recommended that a suitable volatile, nontoxic; greaseless type solvent be used to clean the oil from the braking surface of the new brake drums before they are placed in service to insure the cleanest possible surface.

Gasoline or kerosene should not be used as there is danger that a portion of the diluted oily substance may be left on the braking surface that may later cause difficulty.

Installation

1. Make brake adjustment as outlined in this section.
2. Install brake drum, aligning tang with wheel hub (fig. 15).
3. Install wheel and tire assembly.
4. Make final brake adjustment as outlined in this section and check brake operation.

SPECIAL TOOLS

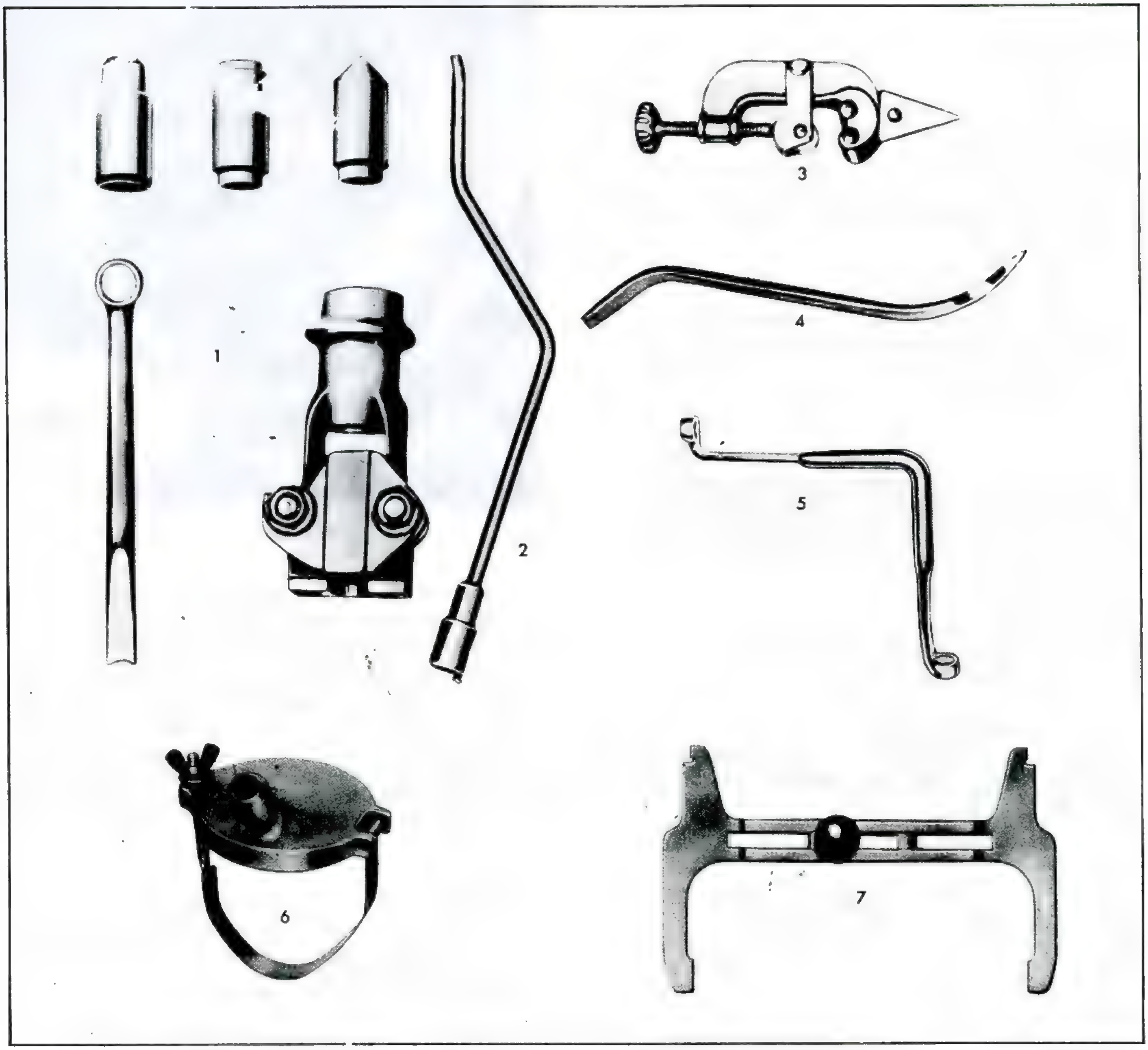


Fig. 28—Special Tools

1. J-8051 Brake Tool Flaring Tool
2. J-8049 Brake Spring Remover and Installer
3. J-8113 Brake Tube Cutter
4. J-9485 Brake Adjusting Tool
5. J-21472 Brake Bleeder Wrench
6. J-21479 Pressure Bleeder Adapter
7. J-21177 Drum-to-Brake Shoe Clearance Gauge

SECTION 6
ENGINE

CONTENTS OF THIS SECTION

CORVAIR 10100 AND 10500 SERIES
ENGINE TUNE-UP

INDEX

GENERAL DESCRIPTION

The engine tune-up has become increasingly important to the modern automotive engine with its vastly improved power and performance. With the higher compression ratios, improved electrical systems and other advances in design, today's engines have become more sensitive to usage and operating conditions, all of which have decided effect on power and performance.

Since the modern engine is admittedly more temperamental and sensitive to adjustments, some means must be devised to put back into the engine the standard of performance and economy of which it is capable.

Since it is seldom advisable to attempt an improvement in performance by correction of one or two items only, time will normally be saved and more lasting results assured if the serviceman will follow a definite and thorough procedure of analysis and correction of all items affecting power, performance and economy.

The tune-up will be performed in three parts. The first part will consist of visual and mechanical checks and adjustments; the second part will consist of mechanical synchronization of carburetors; while the third part will consist of an instrument checkout that can be performed with any one of the modern compact units of service equipment available for this purpose. Always follow the instructions provided by the manufacturer of the particular equipment to be used.

Additional checks and adjustments are included in the latter part of this section for use as required. Many of these operations would normally be used to isolate and correct trouble located during the tune-up. Where conditions are uncovered requiring major corrective action, refer to the appropriate section of this manual for detailed service information.

All operations included herein will be performed on the vehicle. Illustrations depicting bench operations have been employed for convenience only and are intended only to clarify the operations which will be performed on the vehicle. Since it is impractical to illustrate all possible installations that may be encountered, only a typical installation will be used to illustrate the point in question.

MECHANICAL CHECKS AND ADJUSTMENTS

Remove Spark Plugs

1. Remove spare tire.
2. Remove air cleaner assembly.
3. Disconnect spark plug wires at spark plugs.
4. Remove any foreign matter from around spark plugs by blowing out with compressed air then loosen all plugs one turn.
5. Start engine and accelerate to 1000 rpm to blow out loosened carbon.

NOTE: Clearing out carbon in this manner is important in preventing false compression readings due to chips of carbon being lodged under the valves.

ENGINE TUNE-UP CHART

H.P.			95	110	140	180
COMPRESSION PSI (Note 1)			130			
SPARK PLUGS	Make and Number	Colder	AC44FF		AC42FF Competition	
		Standard	AC46FF	AC44FF		
	Gap		.035"	.030"		
IGNITION DISTRIBUTOR	Point Dwell		31°-34°			
	Point Gap		.019 (New) .016 (Used)			
	Arm Spring Tension		19 - 23 Ounces			
	Condenser		.18 - .23 MFD			
BLOWER BELT			55 ± 5 Lbs. (Used) 75 ± 5 Lbs. (New) Using Strand Tension Gauge			
AIR CLEANER			Note 2			
TAPPET ADJUSTMENT			Hydraulic - 1 Turn Down from Zero Lash			
IGNITION TIMING B.T.D.C. (Note 3)	Synchromesh		4°-8°	12°-16°	16°-20°	24°
	Automatic		12°-16°	12°-16°		
ENGINE IDLE RPM	Synchromesh		450-500	600-650		850
	Automatic		Note 4			
FUEL PUMP	Pressure		4 - 5 Lbs. Idle - 1000 R.P.M.			
	Volume		1 Pint in 30 - 45 Seconds			
CRANKCASE VENTILATION			.089" Orifice			

NOTE 1: At cranking speed, throttle wide open -- Maximum Variation 20 pounds between cylinders.
NOTE 2: PAPER ELEMENT -- Service at 12,000 miles initially -- Check every 6,000 miles thereafter.
OIL BATH -- Change oil at regular engine oil change intervals.
NOTE 3: At idle speed with vacuum advance line disconnected and plugged.
NOTE 4: Idle speed on engines with automatic transmission should be set as low as possible to obtain a smooth idle and prevent creep in drive or harsh shifts during transmission operation.

6. Stop engine and remove spark plugs.

   NOTE: A piece of 7/16 I.D. soft rubber or soft plastic tubing approximately 8" long may be used to remove the spark plugs after they have been loosened.

Test Compression

1. Block throttle and choke in wide open position.
2. Hook up starter remote control cable and insert compression gauge firmly in spark plug port (fig. 1).

   CAUTION: Whenever the engine is cranked remotely at the starter, with a special jumper cable or other means, the primary distributor lead must be disconnected from the negative post on the coil and the ignition switch must be in the "ON" position. Failure to do this will result in a damaged grounding circuit in the ignition switch.

   NOTE: Unless special adapters are available, it will be necessary to remove carburetors to perform the compression test.

3. Crank engine through at least four compression strokes to obtain highest possible reading.

Clean and Inspect Spark Pulgs

Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelains and replace plugs where necessary. Refer to spark plug diagnosis information Section 6Y for an analysis of plug conditions. Use new spark plug gaskets with cleaned plugs.

Install Spark Plugs and Torque to Specifications

Service Ingnition System

1. Replace brittle or damaged spark plug wires. Install all wires to proper spark plug.
2. Tighten all ignition system connections.
3. Replace or repair any wires that are frayed, loose or damaged.
4. Remove distributor cap, rotor, and dust shield. Clean cap and inspect for cracks, carbon tracks and burned or corroded terminals. Replace cap where necessary.
5. Clean rotor and inspect for damage or deterioration. Replace rotor where necessary.

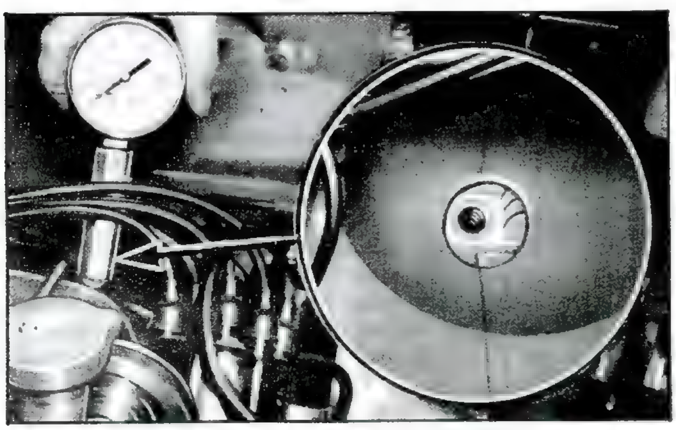


Fig. 1—Checking Compression

6. Check the distributor centrifugal advance mechanism by turning the distributor cam to see if the springs return it to its retarded position. If the cam does not return readily, the distributor must be disassembled and the cause of the trouble corrected.
7. Check to see that the vacuum spark control operates freely by turning the movable breaker plate to see if the spring returns it to the retarded position. Any stiffness in the operation of the vacuum spark control will affect the ignition timing. Correct any interference or binding condition noted.
8. Examine distributor points and clean or replace if necessary.
   - Contact points with an overall gray color and only slight roughness or pitting need not be replaced.
   - Dirty points should be cleaned with a clean point file.

     Use only a few strokes of a clean, fine-cut contact file. The file should not be used on other metals and should not be allowed to become greasy or dirty. Never use emery cloth or sandpaper to clean contact points since particles will embed and cause arcing and rapid burning of points. Do not attempt to remove all roughness nor dress the point surfaces down smooth. Merely remove scale or dirt.
   - Replace points that are burned or badly pitted.
9. Clean cam lobe with cleaning solvent, lubricate cam lobe with "Delco Remy Cam and Ball Bearing Lubricant" or its equivalent and rotate cam lubricator wick 1/2 turn.

   NOTE: Where prematurely burned or badly pitted points are encountered, the ignition system and engine should be checked to determine the cause of trouble so it can be eliminated. Unless the condition causing point burning or pitting is corrected, new points will provide no better service than the old points. Refer to Section 6Y for an analysis of point burning or pitting.

10. Adjust distributor contact point gap to .019" (new points) or .016" (used points), using a feeler gauge or dial indicator (fig. 2). Breaker arm rubbing block should be on extreme top of cam lobe during adjustment.

    NOTE: If contact points have been in service they should be cleaned before adjusting with a feeler gauge.

    - Check alignment of distributor points with points closed (fig. 3). Align new points where necessary, but do not attempt to align used points. Instead, replace used points where serious misalignment is observed.
    - If necessary, align points by bending fixed contact support. Use an alignment tool if available. Do not bend breaker arm.
    - After alignment, readjust point gap.
11. Make sure all distributor wire terminals are clean and tight.
12. Install dust shield, rotor and distributor cap. Press all wires firmly into cap towers.

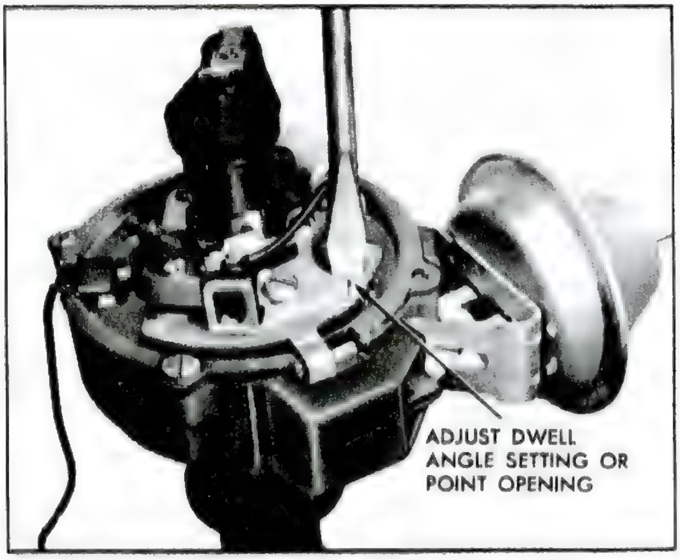


Fig. 2—Point Adjustment

NOTE: Cap must be installed with notch to vacuum advance lever opening on housing.

Service Battery and Battery Cables

Inspect battery and cables and perform necessary service on these components. See Additional Checks and Adjustments for battery tests.

Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with distilled water or water passed through a "demineralizer".

The top of the battery should be clean and the battery hold-down bolts properly tightened. Particular care should be taken to see that the tops of batteries are kept clean of acid film and dirt. For best results when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present and then flush off with clean water. Care must be taken to keep vent plugs tight so that the neutralizing solution does not enter the cell. The hold-down bolts should be kept tight enough to prevent the battery from shaking around in the holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

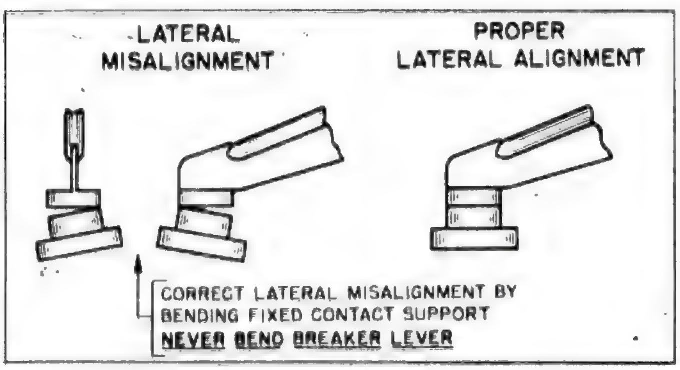


Fig. 3—Point Alignment

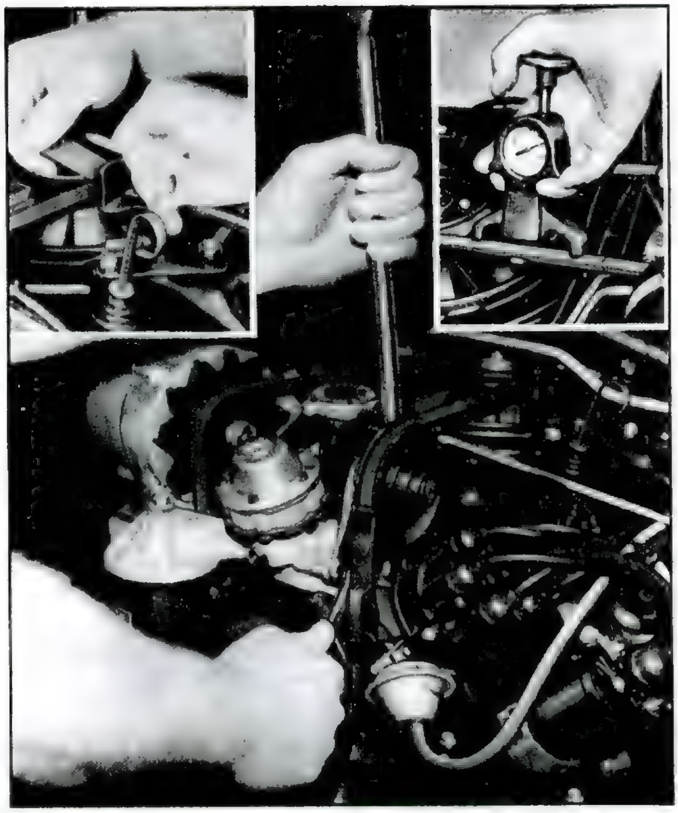


Fig. 4—Blower Belt and Guide Adjustment

To insure good contact, the battery cables should be tight on the battery posts and fully bottomed. To remove or install spring type cable clamps, a suitable pliers must be used to spread the ends of the clamps. Oil battery terminal felt washer. If the battery posts or cable terminals are corroded, the cables should be cleaned separately with a soda solution and a wire brush. It is NOT recommended that the battery posts and cable clamps be greased prior to installing cables to battery as this may contribute to slippage of the calmps from the battery posts.

If battery has remained undercharged, check for loose (worn) blower belt, defective Delcotron, high resistance in the charging circuit, oxidized regulator contact points, or a low voltage setting.

If the battery has been using too much water the voltage output (regulator setting) of the Delcotron is too high.

Service Blower Belt and Delcotron

1. Inspect blower belt condition and check deflection of belt.

   If belt damage is noted, replace the belt. A slightly damaged belt must be replaced to prevent premature failure. Install blower belt over pulleys (Delcotron pulley last).
2. Adjust blower belt and guides as follows:
   - Place a 1/16" shim between belt and rear guide (fig. 4), then using a bar and a strand tension gauge adjust blower belt. Fifty-five lbs. ±5 lbs. (used belt), 75 lbs. ±5 lbs. (new belt) and tighten securely.
   - Remove shim from between blower belt and rear guide and using shim as a gauge adjust upper guide (fig. 4) and tighten securely.

3. If a new belt was installed run belt in at 1500 rpm for at least two minutes, then recheck deflection.

   NOTE: If a strand tension gauge is not available adjust belt to give a 3/8 deflection between blower and idler pulley under a 15 pound load and have belt set with a strand tension gauge as soon as possible.

4. Replace or repair frayed or broken Delcotron wires and tighten all wire connections.

Service Fuel Lines and Fuel Filter

Inspect fuel lines for kinks, bends or leaks and if engine has been flooding, replace fuel inlet filter.

NOTE: If a compliant of poor high speed performance exists on the vehicle, fuel pump tests should be performed.

Service Air Cleaner

Refer to Engine Fuel, Section 6M.

Service Crankcase Ventilation (Fig. 5)

1. Disconnect hose from vent pipe.
2. Inspect for deteriorated or plugged hoses.
3. Clean positive ventilation orifice, using a 5/64" drill (inserted through orifice in vent pipe and twisted by hand).
4. Connect hose to vent pipe, then inspect all connections.

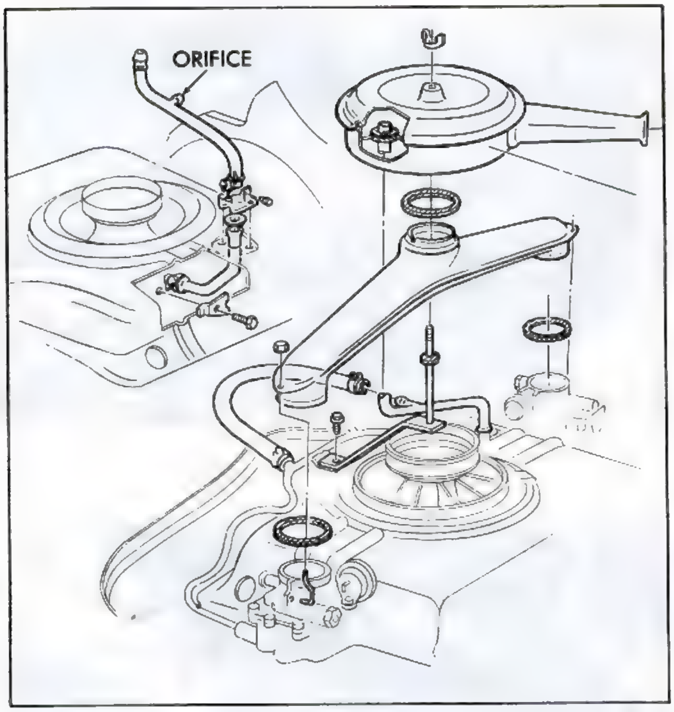


Fig. 5—Crankcase Ventilation

CARBURETOR SYNCHRONIZATION

Mechanical Adjustments

1. Disconnect accelerator control rod swivel at cross shaft lever and connect accelerator pull back spring to swivel hole in cross shaft lever "A" (fig. 6).

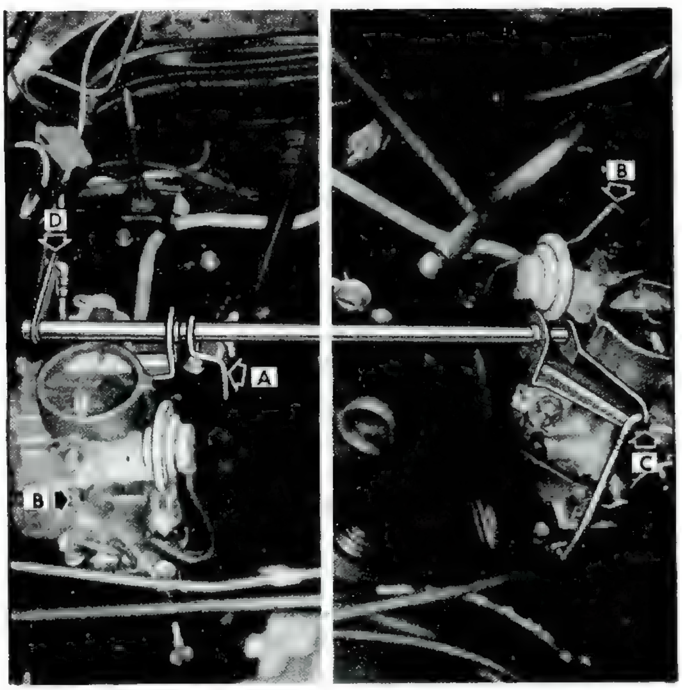


Fig. 6—Carburetor Linkage

2. Disconnect choke rods at choke shaft levers on both carburetors and open choke valves "B" (fig. 6), then tighten carburetor hold down nuts.
3. Back idle screws away from throttle shaft levers on both carburetors (2-1/2 turns should be sufficient) to leave clearance between the throttle shaft levers and idle screws.
4. Disconnect throttle rod from cross shaft lever on R/H carburetor "C" (fig. 6).

   NOTE: A strip of paper approximately 3/8" wide and 8" long should be used in the following step. Feeler gauge stock will not provide a SENSITIVE feel and should not be used.

5. Set idle screw on L/H carburetor by placing strip of paper between idle screw and throttle shaft lever and turning screw in until a firm drag is felt on the paper. Turn idle screw in 1-1/2 additional turns (fig. 7).

   NOTE: This will give an initial idle speed of 500-600 rpm.

6. Connect throttle rod to cross shaft lever on R/H carburetor and disconnect throttle rod from cross shaft lever on L/H carburetor "D" (fig. 6).
7. Set idle screw on R/H carburetor in the same manner as L/H carburetor.
8. Adjust throttle rod on L/H carburetor by holding up on rod (so throttle shaft lever is against idle screw) and turning rod in lower swivel until rod freely enters hole in cross shaft lever (fig. 8).
9. Connect throttle rod on L/H carburetor to cross shaft lever.

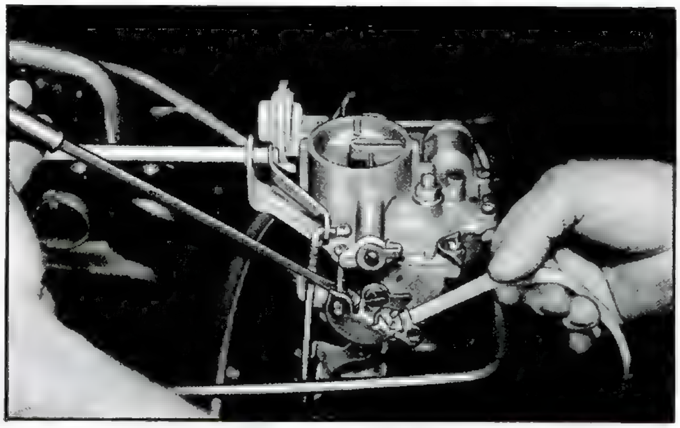


Fig. 7—Adjusting Idle Speed Screw

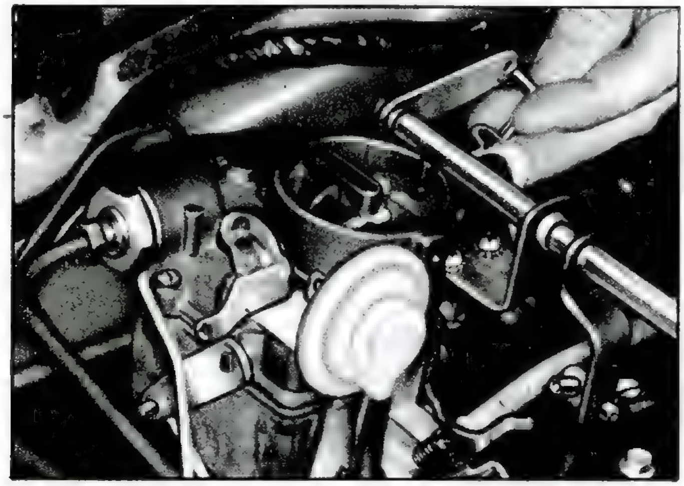


Fig. 8—Adjusting Throttle Rod

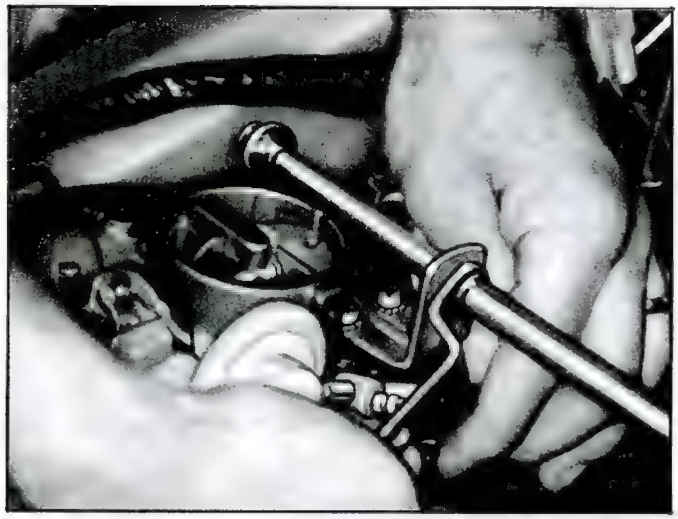


Fig. 9—Adjusting Accelerator Rod

10. Remove accelerator pull back spring from cross shaft lever, hold cross shaft lever in the full throttle position and pull accelerator control rod rearward (on vehicles equipped with Powerglide, pull through detent), and adjust swivel on accelerator control rod until it freely enters hole in cross shaft lever (fig. 9). Then connect swivel and pull back spring and be sure carburetors return to idle position (idle screws against throttle levers).
11. Turn idle mixture screws on both carburetors lightly to its seat and back out 1-1/2 turns.

INSTRUMENT CHECK-OUT

Instrument Hook-Up

1. Remove distributor vacuum advance hose from R/H carburetor spark port tube and plastic cap from L/H carburetor spark port tube.
2. Connect vacuum gauge, dwell meter, tachometer and timing light.

   NOTE: The vacuum gauge must be connected to both carburetor spark port tubes. A windshield washer tee makes this possible (fig. 10).

Ignition Dwell

1. Start engine and check ignition dwell.
   If dwell is not within specifications, recheck point gap, check for wrong point assembly, defective or misaligned point, worn rubbing block or worn distributor cam.
2. Check dwell variation.
   Slowly accelerate engine to 1500 rpm and note dwell reading. Return engine to idle and note dwell reading. If dwell variation exceeds specifications, check for worn distributor shaft, worn distributor shaft bushing or loose breaker plate.

CAUTION: Accelerate engine at accelerator rod only. Do not open throttle by grasping other portions of linkage.

Set Ignition Timing

1. Adjust timing as required by loosening distributor clamp bolt and rotating distributor body until specified timing is indicated at tab (fig. 11), then tighten distributor clamp bolt.

   NOTE: Timing should be advanced as far as possible (within specifications) unless detonation (spark-knock) occurs.
2. Check operation of centrifugal advance mechanism by accelerating engine and watching clockwise (advance) movement of timing mark.

Check Carburetor Synchronization as Follows:

1. Accelerate engine to 1100 to 1200 rpm and hold steady.

   NOTE: A tool to hold engine rpm steady may be manufactured with a small turn buckle and

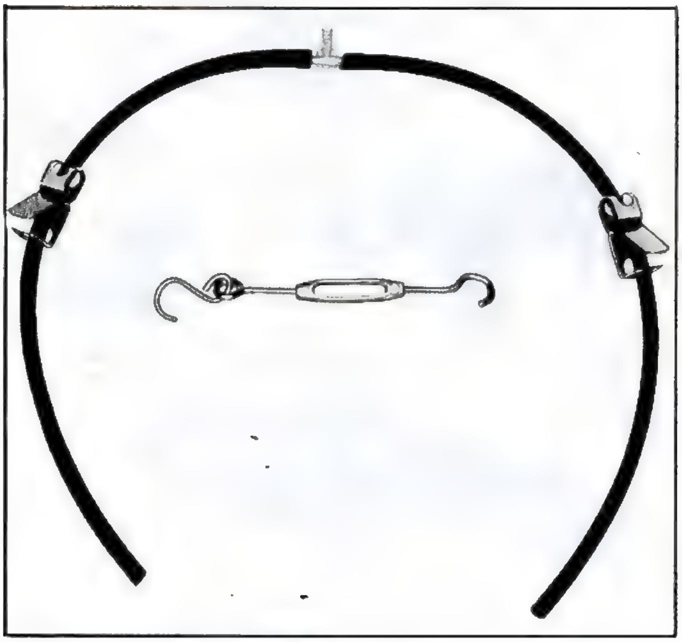


Fig. 10—Vacuum Gauge Adapter and Turnbuckle

hooks (fig. 10). When this tool is installed between the accelerator rod and fuel line the rpm can be adjusted by turning turnbuckle.

2. With rpm set to 1100 to 1200 and steady, note vacuum reading. Pinch shut vacuum gauge hose to R/H carburetor and note vacuum reading. If vacuum decreases, return engine to idle and lengthen throttle rod (one turn) on L/H carburetor, then recheck.
   If vacuum increases, return engine to idle and shorten throttle rod (one turn) on L/H carburetor, then recheck.
   If vacuum remains steady (±1") open hose to R/H carburetor and pinch shut vacuum gauge hose to L/H carburetor. Vacuum should remain steady (±1").
3. Disconnect vacuum gauge from spark port tubes and reinstall distributor vacuum advance hose on R/H carburetor and plastic cap on L/H carburetor.

Vacuum Advance

Check operation of vacuum advance by accelerating engine and watching movement of vacuum advance arm.

Idle Speed and Mixture Adjustment

1. Disconnect choke diaphragm hoses from both carburetor bases and connect vacuum gauge at these locations.
2. Adjust idle speed (duplicate adjustment on both carburetors) to obtain specified engine idle.
3. Adjust idle mixture screws on both carburetors to obtain peak, steady vacuum at specified idle speed.

Adjust Fast Idle Cam Clearance (Fig. 12)

1. Stop engine.
2. With throttle lever on next to the highest step of fast idle cam, bend tang to obtain .078" clearance between idle speed screw and throttle lever.

Adjust Vacuum Diaphragm (Fig. 13)

1. Hold choke valve closed with a rubber band.
2. Hold vacuum diaphragm arm squarely against diaphragm.

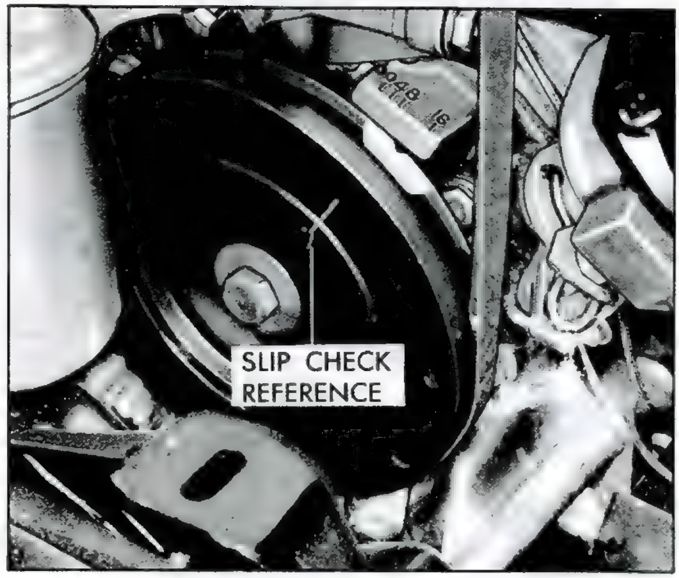


Fig. 11—Ignition Timing

3. Measure clearance between lower edge of choke valve [illegible] wall of bowl cover. Clearance should be .180" to [illegible]5".
4. If necessary to adjust, disconnect and bend diaphragm link.
5. At this setting, throttle lever fast idle tang should rest on next to the highest step of fast idle cam. If not, adjust by bending outer choke shaft lever tang.

Adjust Vapor Vent (Fig. 14)

The vent should just start opening when idle screw is on high step of fast idle cam. The valve will then be open at idle setting. If necessary, adjust by bending throttle lever tang.

NOTE: It is hard to see this valve when carburetor is installed. A mirror will aid in making this adjustment.

Adjust Choke (Fig. 15)

Hold choke valve closed and, while holding the control rod up against the stop in choke thermostat bracket, adjust upper choke control rod until it freely enters hole in choke shaft lever, then lengthen rod two turns and connect.

CAUTION: To minimize the possibility of deforming the control rod while adjusting, always turn the vertical portion. Do not "crank" the rod using offset portion.

Adjust Choke Unloader (Fig. 16)

Check unloader adjustment by holding throttle valve in wide open position and insert a .312" wire gauge between choke valve lower edge and wall of bowl cover. To adjust, if necessary, bend tang on throttle lever.

Final Adjustment

1. Install air cleaner assembly.
2. Start engine, and if necessary, readjust carburetor idle speed and mixture.
3. Shut engine off, remove instruments, then connect choke vacuum break hoses, and install spare tire.

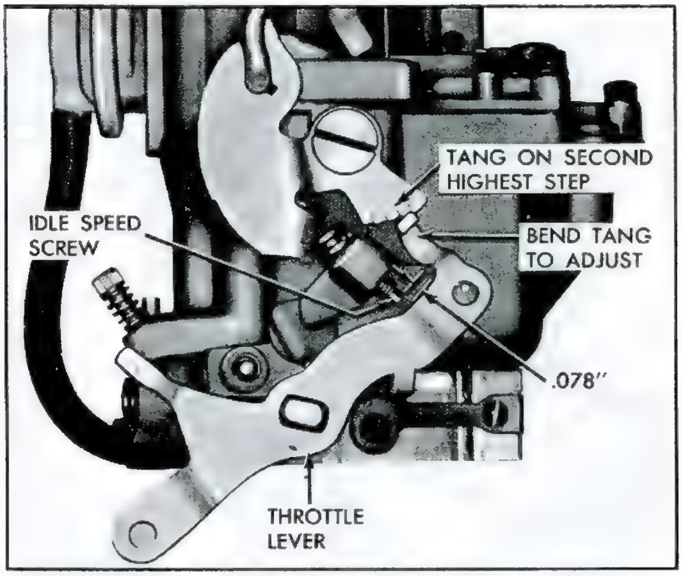


Fig. 12—Fast Idle Cam Adjustment

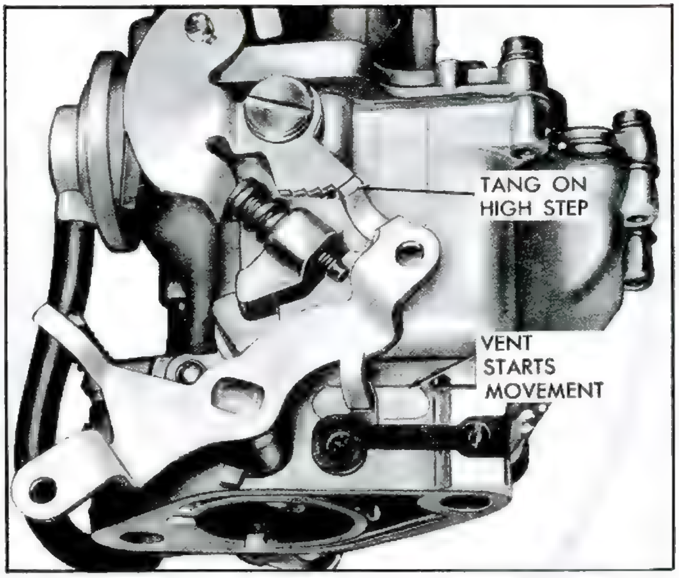


Fig. 14—Vapor Vent Adjustment

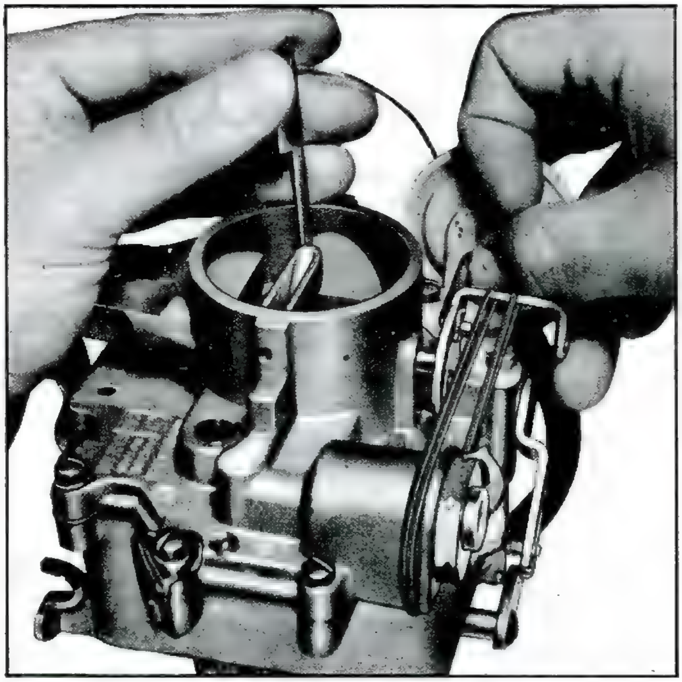


Fig. 13—Vacuum Diaphragm Adjustment

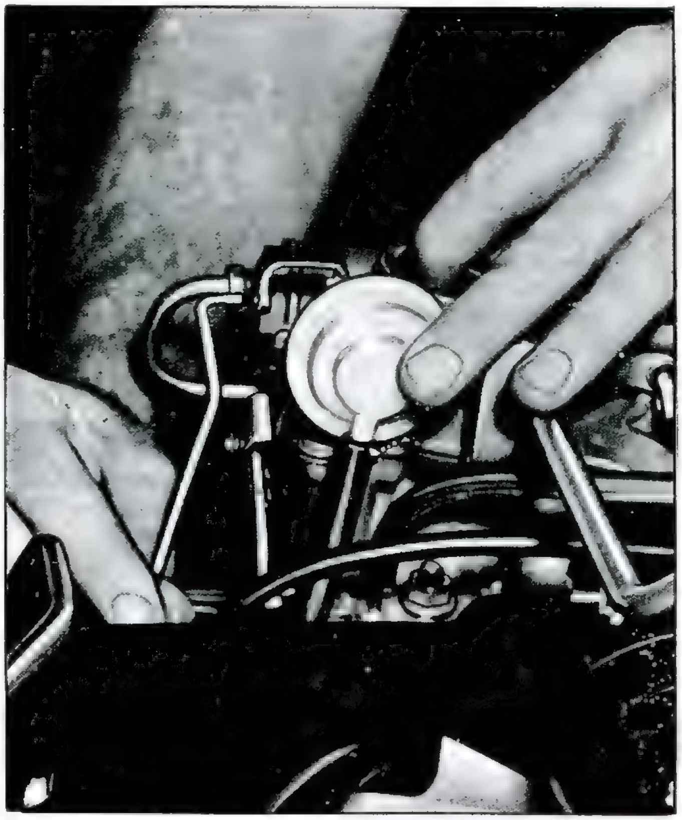


Fig. 15—Choke Control Rod Adjustment

ADDITIONAL CHECKS

Cylinder Balance Test (Fig. 17)

It is often difficult to locate a weak cylinder. A compression test, for example, will not locate a leaky intake manifold, a valve not opening properly due to a worn camshaft, or a defective spark plug.

With the cylinder balance test, the power output of one cylinder may be checked against another, using a set of grounding leads. When the power output of each cylinder is not equal, the engine will lose power and run roughly. Tool J-7412 is available to perform this test.

Perform a cylinder balance test as follows:

1. Connect the tachometer and vacuum gauge.
2. Start engine and run at 1500 rpm.

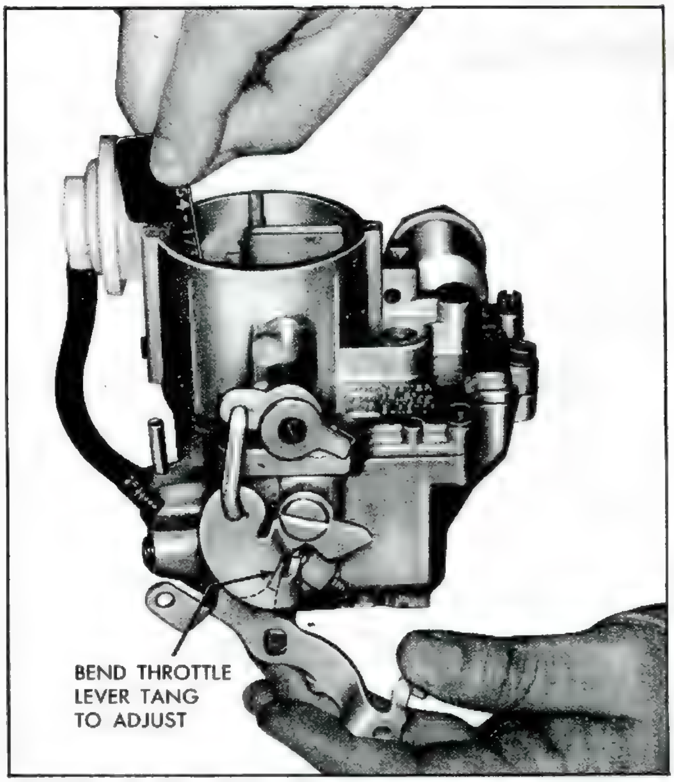


Fig. 16—Choke Unloader Adjustment

3. Ground large clip of grounding leads and connect individual leads to all spark plugs except the pair being tested. Divide the firing order in half and arrange one-half over the other. The cylinders to be tested together appear one over the other, i.e.,
   Firing Order=1-4-5-2-3-6=$\frac{1\text{-}4\text{-}5}{2\text{-}3\text{-}6}$=1-2, 4-3, 5-6.

4. Operate engine on each pair of cylinders in turn and note engine rpm and manifold vacuum for each pair. A variation of more than 1 inch of vacuum or 40 rpm between pairs of cylinders being tested indicates that the cylinders are off balance.
5. To isolate one weak cylinder, short out one bank of cylinders at a time. The bank giving the lower readings will include the weak cylinder.

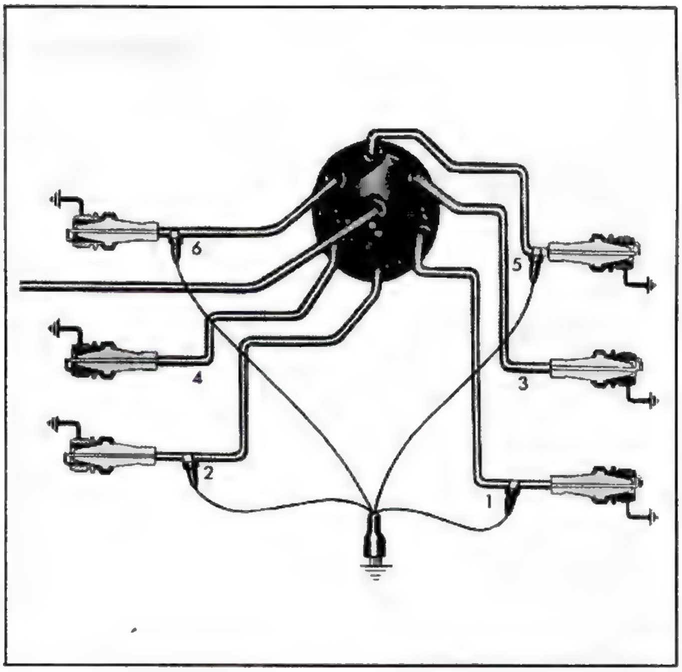


Fig. 17—Cylinder Balance Test

Starting Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

Charging Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks and regulator adjustments.

Ignition Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

Fuel Pump Tests

If the owner has complained of poor high speed performance, the fuel pump may be at fault. Too low a pump pressure or volume will cause a high speed miss because of lack of fuel delivered to the carburetors, while too high a pressure will cause carburetor flooding. See Engine Fuel--Section 6M for a description of fuel pump checks.

ENGINE MECHANICAL

INDEX

GENERAL DESCRIPTION

The six cylinder, over head valve, engines covered in this section are the 164 cu. in. engines used in the Corvair 10100 and 10500 series vehicles (fig. 18). The engine is horizontally opposed, air cooled and has two opposing, aluminum cylinder heads that incorporate integral intake manifolds.

The aluminum crankcase is vertically divided into two halves, each having three pilot openings for individual cast iron cylinders. The crankshaft and camshaft are located between the split halves of the crankcase. The cranksha , supported by the crankcase halves, has four main bearings. The camshaft journals, having no bearings, ride directly on the crankcase halves.

The cylinders are numbered rear to front: 1-3-5 on the right bank, and 2-4-6 on the left bank. Firing order is 1-4-5-2-3-6. Crankshaft rotation as viewed from the rear is counter-clockwise.

Full pressure lubrication, through a full flow oil filter and an air cooled oil cooler is furnished by a gear-type oil pump located in the engine rear housing. The distributor, driven by a helical gear on the crankshaft, drives the oil pump. The main oil gallery feeds oil

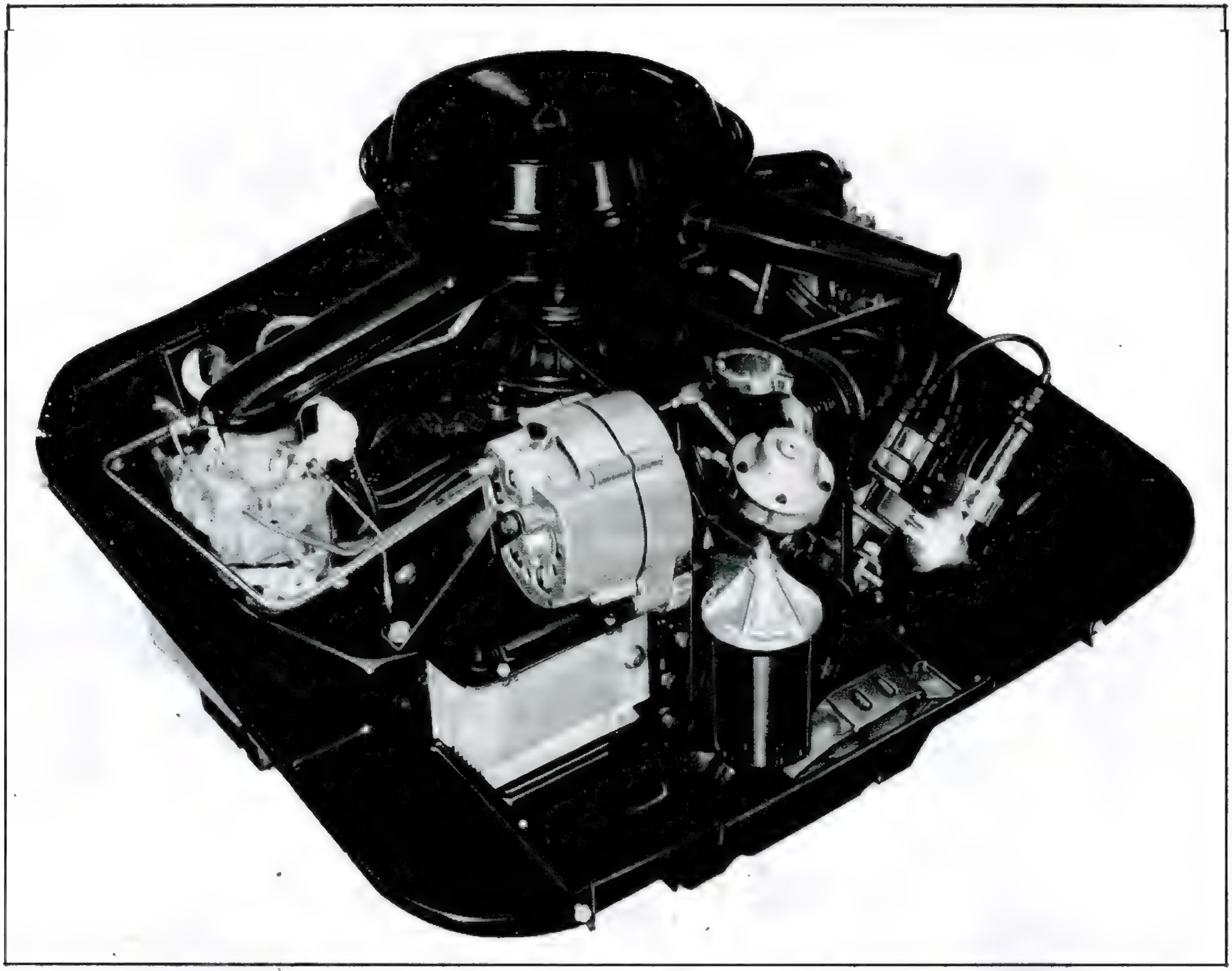


Fig. 18—Corvair Engine

through drilled passages to the camshaft and crankshaft journals. The main oil gallery also feeds the hydraulic valve lifters, which through hollow push rods feed the individually mounted rocker arms (fig. 19).

Engine cleanliness is very important, oil leaks, exhaust leaks or foreign material within the engine shrouding may result in objectionable fumes within the passenger compartment.

COMPONENT REPLACEMENT AND ADJUSTMENTS

ENGINE SEAL AND SHIELDS

Seal and Retainer (Fig. 20)

Removal

1. Remove spare tire, then remove air cleaner assembly.
2. Remove retainer to body attaching screws.
3. Disconnect seal from engine shields by pushing groove of seal off shield flange.
4. Remove seal and retainer assembly.

Installation

1. Lubricate groove of seal with liquid soap or silicone and place seal and retainer assembly in position over engine shields.
2. While guiding groove of seal on shield flange, (with one hand), press seal in place using a block of wood or a hammer handle.
3. Install all retainer attaching screws finger tight, then tighten screws securely.

Front Shield (Fig. 21)

Removal

1. Disconnect battery positive cable.
2. Remove spare tire, then remove air cleaner assembly.
3. Remove vacuum balance tube.
4. Disconnect heater hose at upper shroud.

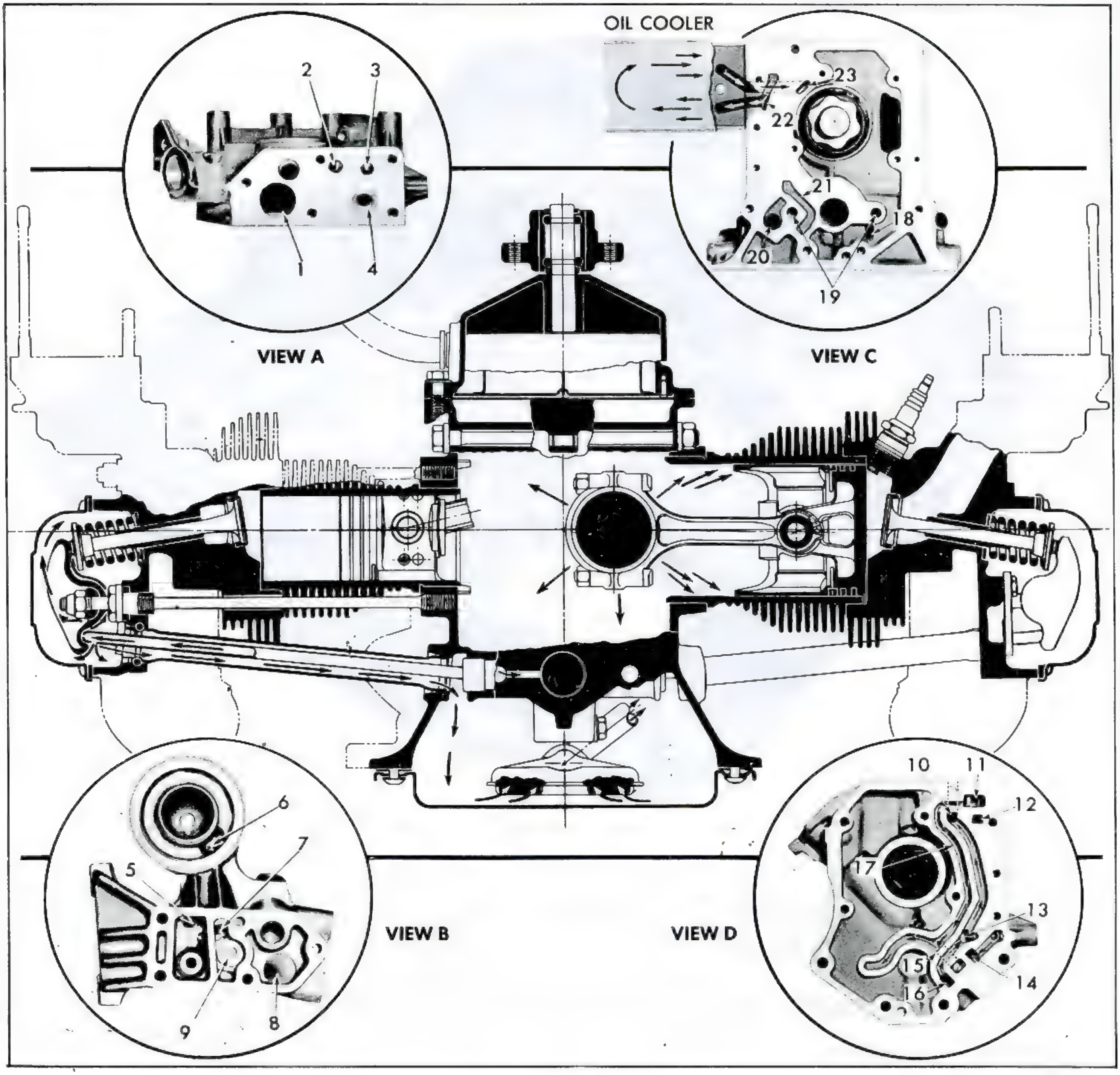


Fig. 19—Engine Lubrication

View A Top face of engine rear housing
View B Bottom face of oil filter and Delcotron adapter
View C Rear of engine crankcase
View D Front face of engine rear housing

NOTE: • Face of oil filte and Delcotron adapter shown in View "B" mounts to top face of engine rear housing shown in View "A."
• Front face or engine rear housing shown in View "D" mounts to rear face of engine crankcase shown in View "C."

1. Oil Filler Inlet
2. To Oil Filter
3. To Oil Cooler
4. Oil Cooler By-Pass Valve
5. Oil Filter Outlet
6. Oil Filter Element Inlet
7. Oil Filter Inlet
8. Oil Filler Inlet
9. Oil Filter By-Pass Valve
10. To Oil Filter
11. Oil Cooler By-Pass Valve Exit
12. To Oil Cooler from the Oil Filter
13. Oil Pressure Regulator Entrance
14. Oil Pump Inlet
15. Oil Passage to Main Oil Gallery Left Side
16. Oil Pump Outlet
17. Oil from Oil Cooler
18. Entrance to Crankcase Sump
19. Main Oil Galleries
20. Oil Pump Suction
21. Oil Pump Outlet Cavity
22. Oil Cooler Inlet
23. Oil from Cooler to Main Galleries

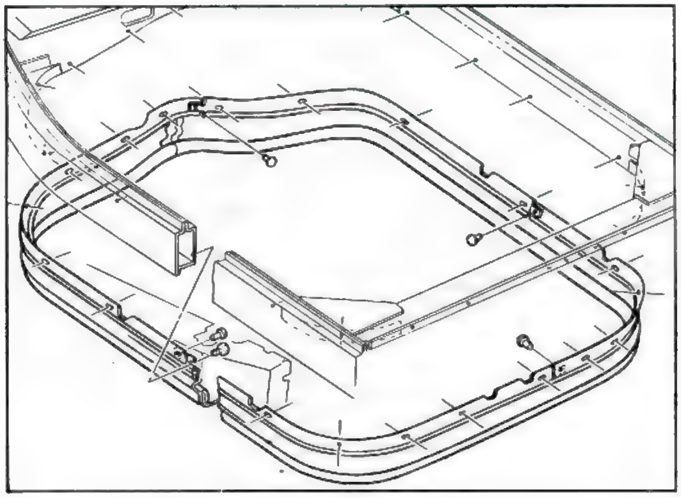


Fig. 20—Engine Seal and Retainer

5. Remove grommet for Powerglide dip stick tube (if so equipped).
6. Disconnect seal from flange of front shield.
7. Remove grommet (for starter wiring and fuel line) from front shield.
8. Disconnect starter wiring (engine side).
9. From the underside of vehicle: disconnect accelerator rod at transmission bellcrank and disconnect fuel line at flexhose (plug fuel line from fuel tank), then disconnect axle dip stick tube at differential carrier.
10. Disconnect accelerator rod at carburetor cross shaft, then remove rod and bellows from front shield.
11. Disconnect grommet from front shield and remove axle dip stick tube assembly.
12. Disconnect fuel line at fuel pump, then remove fuel line from front shield.
13. Remove bolts attaching front shield, then remove front shield.

Installation

1. Install front shield by guiding shield over starter wiring and Powerglide dip stick tube (if so equipped).
2. Install all bolts attaching front shield finger tight, then tighten bolts securely.
3. Install fuel line through front shield, then connect fuel line at fuel pump.
4. Install accelerator rod through front shield, then connect bellows to front shield and connect accelerator rod at carburetor cross shaft.
5. Install axle dip stick tube assembly through front shield and connect grommet in front shield.
6. Connect starter wiring.
7. Install grommet (for starter wiring and fuel line) in front shield.
8. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
9. Install grommet for Powerglide dip stick tube (if so equipped).
10. Connect heater hose at upper shroud.
11. Install vacuum balance tube.
12. From the underside of vehicle: connect fuel line at flexhose, connect accelerator rod at transmission bellcrank and connect axle dip stick tube at differential carrier.
13. Connect battery positive cable.
14. Install air cleaner assembly, then install spare tire.

Left Shield (Fig. 21)

Removal

1. Remove bolts attaching left side of upper shroud and left shield to cylinder head.
2. Remove bolts attaching left shield to left exhaust duct.
3. Remove bolt attaching left shield and oil cooler to cylinder head.
4. Remove bolts attaching left shield to front shield and (if so equipped) remove screw from ground strap.
5. Disconnect seal from flange of left shield.
6. Remove left shield, by pulling from under upper shroud, front shield and oil cooler flange.

Installation

1. Place left shield in position under upper shroud, front shield and oil cooler flange.
2. Install all bolts attaching left shield finger tight, then tighten bolts securely.
3. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
4. Connect ground strap (if so equipped).

Right Shield (Fig. 21)

Removal

1. Remove spare tire then, remove bolts attaching right side of upper shroud and right shield to cylinder head.
2. Remove bolts attaching right shield to right exhaust duct.
3. Remove ignition coil and bracket.
4. Remove bolts attaching right shield to front shield and (if so equipped) remove screw from ground strap.
5. Disconnect seal from flange of right shield.

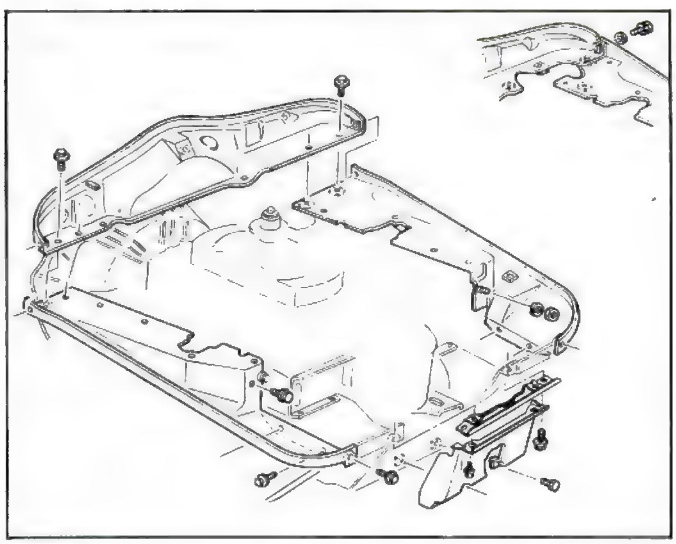


Fig. 21—Engine Shields

6. Remove bolt attaching muffler bracket to right shield.
7. Remove muffler.
8. Remove right shield by pulling from under upper shroud and front shield.

Installation

1. Place right shield in position under upper shroud and front shield.
2. Install all bolts attaching right shield finger tight, then tighten bolts securely.
3. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
4. Connect ground strap (if so equipped).
5. Install ignition coil and bracket, then install spare tire.

Rear Center Shield (Fig. 21)

NOTE: The rear center shield is two pieces. The engine seal is connected to the upper half, which need not be removed under normal conditions.

Removal and Installation (Lower Half)

1. Remove bolts attaching rear center shield to skid plate and exhaust ducts.
2. Remove rear center shield.
3. Place rear center shield in position with attaching bolts fingertight, then tighten bolts securely.

Removal and Installation (Upper Half)

1. Remove lower half as outlined.
2. Disconnect seal from flange of rear center shield.
3. Remove bolts and remove upper half.
4. Install upper half and tighten securely.
5. Install lower half as outlined.
6. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand) press seal in place with a block of wood or a hammer handle.

Muffler Heat Shield (Fig. 22)

Removal

1. Remove two bolts attaching heat shield to muffler hanger.

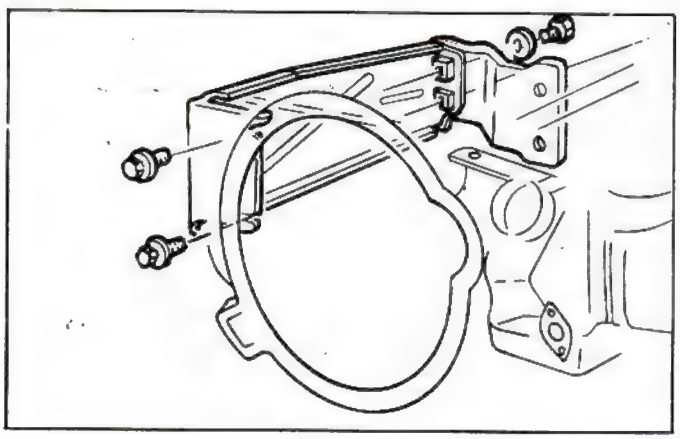


Fig. 22—Muffler Heat Shield

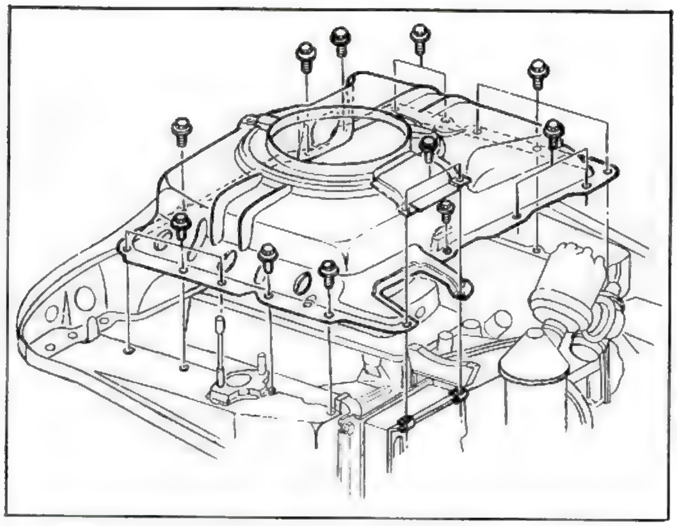


Fig. 23—Upper Shroud

2. Loosen two bolts attaching rear of heat shield and right rear shroud to cylinder head.
3. Remove heat shield.

Installation

1. Install heat shield in position under head of two bolts in rear of cylinder head.
2. Install bolts attaching heat shield to muffler hanger and tighten securely.
3. Tighten two bolts attaching rear of heat shield and right rear shroud to cylinder head.

ENGINE COOLING COMPONENTS

Upper Shroud (Fig. 23)

Removal

1. Remove spare tire then remove air cleaner assembly.
2. Disconnect fuel lines at fuel pump and carburetors, then remove fuel lines to carburetors.
3. Disconnect vacuum advance hose at right carburetor.
4. Disconnect accelerator rod at carburetor cross shaft and disconnect choke control rods at choke levers then remove upper choke control rods.
5. Remove carburetors with cross shaft and linkage attached.
6. Remove blower belt.
7. Disconnect crankcase ventilation tube at upper shroud, then disconnect vacuum balance tube at bracket and cylinder heads.
8. Remove vacuum balance tube and crankcase ventilation tube and hoses as an assembly.
9. Remove Delcotron with bracket attached.
10. Disconnect heater hose at upper shroud.
11. Remove oil cooler access hole cover and oil dip stick.
12. Remove distributor cap, then remove spark plug wires and distributor cap as an assembly.
13. Remove bolts attaching upper shroud, then remove shroud by raising front of shroud and rotating clockwise to clear oil filter and Delcotron adapter.

Installation

1. Place upper shroud in position and install all attaching bolts finger tight then rotate blower checking clearance while tightening bolts securely.
2. Install oil cooler access hole cover and oil dip stick, then install spark plug wires and distributor cap assembly.
3. Connect heater hose at upper shroud.
4. Install Delcotron and Delcotron bracket.
5. Install vacuum balance tube and crankcase ventilation tube and hoses.
6. Install blower belt and adjust as outlined.
7. Install carburetors and cross shaft then connect vacuum advance hose at right carburetor.
8. Install, adjust and connect upper choke control rods, then adjust and connect accelerator rod as outlined in Engine Tune-Up.
9. Install and connect fuel lines.
10. Install air cleaner assembly, then install spare tire.

Lower Shrouds and Thermostats (Fig. 24)

Removal

1. Remove bolts attaching lower shroud to crankcase, cylinder head, front shroud and exhaust duct.
2. Drop lower shroud until swivel on thermostat rod can be disconnected from exhaust duct damper.
3. Disconnect swivel and remove lower shroud and thermostat assembly.

Thermostat Replacement

NOTE: In the event of a failed thermostat bellows, the exhaust duct damper will remain in the open position allowing a maximum air flow over the engine to prevent overheating.

1. Remove lower shroud as outlined.
2. Using an open end wrench, on the flat provided, hold thermostat and remove thermostat actuating rod and swivel assembly.
3. Remove nut attaching thermostat to bracket, then remove thermostat.
4. Install new thermostat and tighten securely.
5. Install thermostat actuating rod and swivel assembly and tighten securely.

CAUTION: To prevent damage to the thermostat bellows while tightening actuating rod, hold flat on thermostat with an open end wrench.

Thermostat Adjustment

1. Install lower shroud assembly with two bolts (one to crankcase and one to cylinder head).
2. Hold exhaust duct damper in the fully open position and pull the thermostat actuating rod out the maximum travel (thermostat against bracket stop).
3. Adjust the swivel until it just enters the hole provided in the exhaust duct damper.
4. Remove lower shroud assembly and connect retaining clip, then install lower shroud as outlined.

Installation

1. Connect swivel to exhaust duct damper then install all lower shroud attaching bolts and tighten securely.
2. Check adjustment verifying that thermostat bottoms at bracket before damper hits stop.

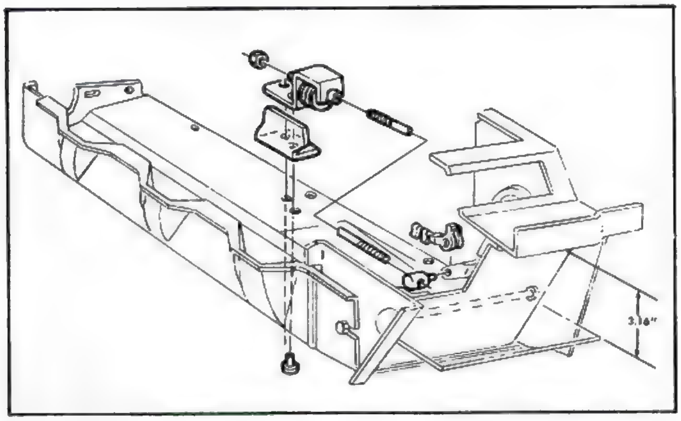


Fig. 24—Lower Shroud and Thermostat

Front Shrouds (Fig. 25)

Removal

1. Remove lower shroud as outlined.
2. Remove exhaust manifold as outlined.
3. Disconnect heater hose at elbow on front shroud.
4. Remove bolts attaching front shroud to cylinder head and upper shroud, then remove front shroud and heater elbow as an assembly.

NOTE: On left front shroud, one attaching bolt (to cylinder head) is reached through heater elbow.

Installation

1. Install front shroud and tighten securely.
2. Connect heater hose.
3. Install exhaust manifold as outlined.
4. Install lower shroud as outlined.

Exhaust Ducts (Fig. 25)

Removal

1. Disconnect seal from flange of exhaust duct and rear center shield.
2. Remove ignition coil and bracket (for right exhaust duct).
3. Remove grille, then, remove rear center shield as outlined.
4. Remove lower shroud as outlined.
5. Remove exhaust duct attaching bolts, then remove exhaust duct.

Installation

1. Install exhaust duct with all bolts finger tight, then tighten bolts securely.
2. Install lower shroud as outlined.
3. Install rear center shield as outlined, then, install grille.
4. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto rear center shield and exhaust duct flange (with one hand), press seal in place with a block of wood or a hammer handle.
5. Install ignition coil and bracket (if removed).

Rear Shrouds (Fig. 25)

Removal

1. Remove oil cooler (for left rear shroud) or remove ignition coil and bracket (for right rear shroud).

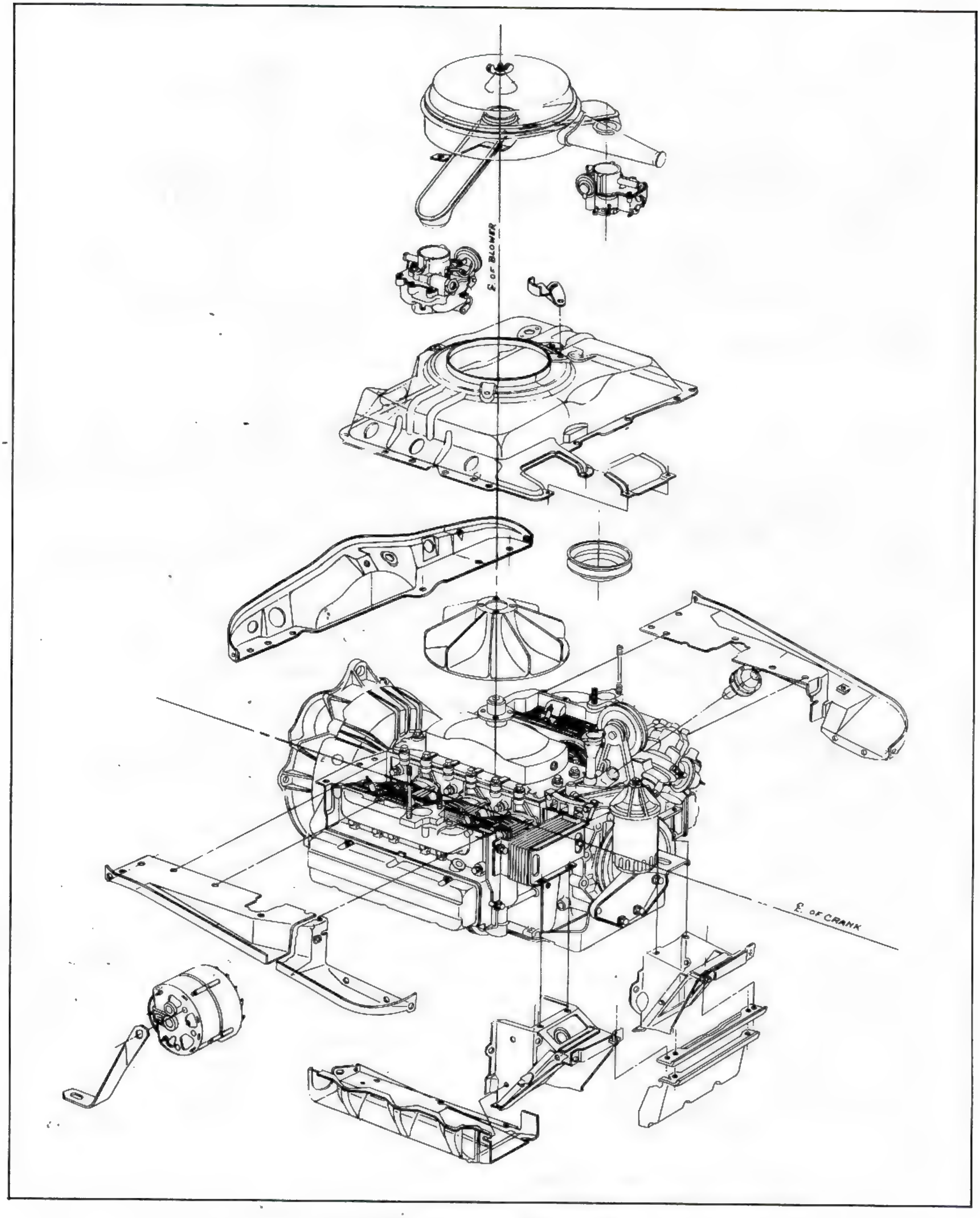


Fig. 25—Engine Sheet Metal—Exploded View

2. Remove lower shroud as outlined.
3. Remove exhaust duct as outlined.

NOTE: For right rear shroud it is necessary to disconnect the wiring at the cylinder head temperature and oil pressure sending units, then disconnect at harness quick-disconnect so harness may be removed with shroud.

4. Disconnect bolts attaching upper shroud to rear shroud, then remove rear shroud.

Installation

1. Install rear shroud, then install exhaust duct and lower shroud as outlined.
2. Install oil cooler and/or ignition coil and bracket.

Blower Belt, Idler Pulley and Belt Guides (Fig. 26)

Removal

1. Loosen nut and bolt at idler pulley and remove blower belt.
2. If necessary, remove bolt and remove idler pulley and rear belt guide as a unit.
3. If necessary, remove bolts attaching upper belt guide and remove upper guide.

Installation and Adjustment

1. If removed, install uper guide leaving bolts finger tight.
2. If removed, install rear guide and idler pulley as a unit and leave bolt and nut finger tight.
3. Install blower belt over pulleys (Delcotron pulley last).
4. Adjust blower belt as follows:

Place a 1/16" shim between belt and rear guide then using a bar and a strand tension gauge adjust blower belt to 55 lb. ± 5 lb. (used belt), 75 lbs. ±5 lb. (new belt) and tighten bolt and nut securely.

Remove shim from between blower belt and rear guide then using shim as a gauge adjust upper guide and tighten securely.

Blower

Removal

1. Remove upper shroud as outlined.
2. Remove bolts from blower pulley, then remove blower pulley and blower from blower bearing hub.

NOTE: For blower bearing replacement refer to Crankcase Cover.

Installation

1. Install blower and blower pulley on blower bearing hub, then install bolts and torque to specifications.
2. Install upper shroud as outlined.

EXHAUST MANIFOLDS

Removal

1. Remove lower shroud as outlined.
2. Remove nuts at exhaust manifold flange (retaining exhaust pipe).
3. Bend french locks, then remove nuts, locks and clamps.
4. Using a soft hammer tap exhaust manifold off exhaust port sleeves then remove and discard all packings.

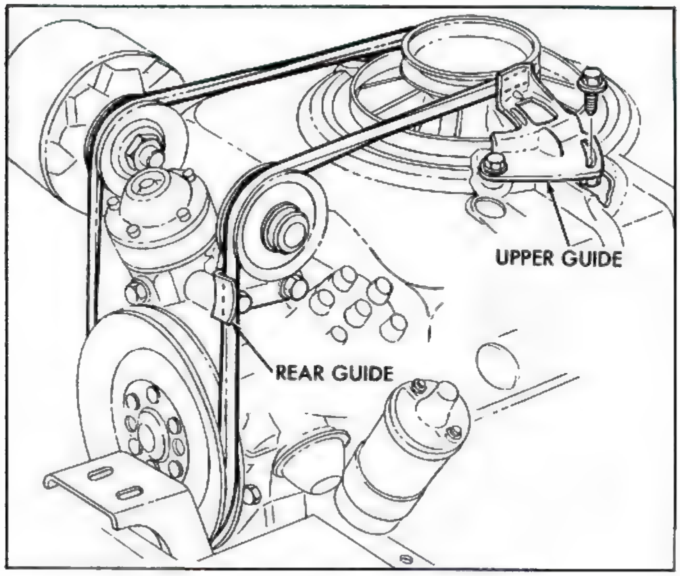


Fig. 26—Blower Belt and Guides

Installation

1. Using new packings install exhaust manifold over exhaust port sleeves, then install clamps, locks and nuts.
2. Tighten manifold clamp nuts a little at a time until specified torque is reached. Tap manifold in place over exhaust port sleeves with a soft hammer while tightening nuts.
3. Bend french locks, then install lower shrouds.
4. Using a new packing, connect exhaust pipe to exhaust manifold.

ENGINE MOUNTS

NOTE: Front and rear engine mounts are of the non-adjustable type. Because of this, service is seldom required. Broken or deteriorated mounts should be replaced immediately because of the added strain on other mounts and other drive line components.

Front Mounts (Fig. 27)

Replacement

1. On engines equipped with synchromesh transmission; remove clutch lever ball stud from front mount bracket, then disconnect shift rod coupling from transmission shift rod.

On engines equipped with Powerglide transmission, disconnect control cable.

2. Place engine lift, with Tool J-7894 attached, under engine.
3. Remove cotter key and nut from each engine front mount.
4. Lower engine enough to release weight from front mounts.
5. Disconnect emergency brake return spring from front mount bracket.
6. Remove bolts attaching front mount bracket to transmission.

NOTE: On synchromesh equipped vehicles be careful not to drop the spacer on the one 7/16" bolt.

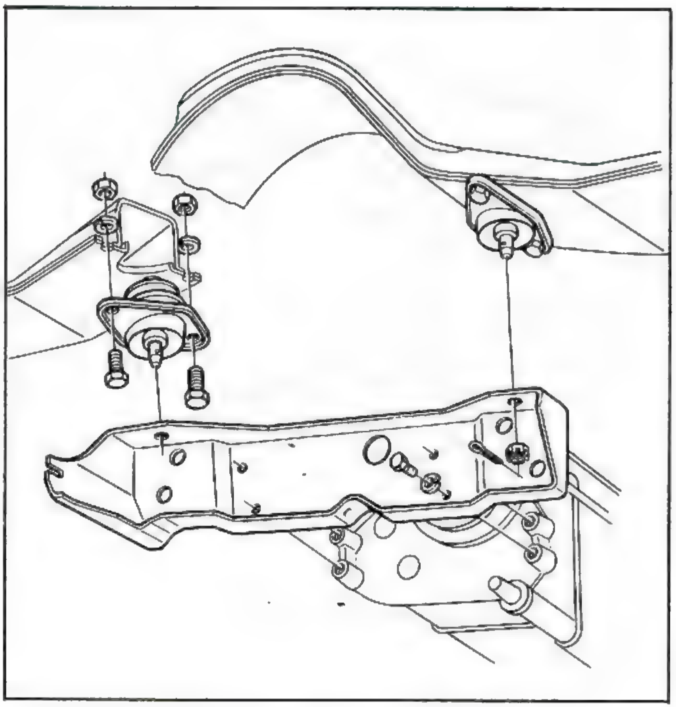


Fig. 27—Front Mounts

7. Remove front mount bracket and spacer (if used).
8. Remove front mount retaining nuts, then remove front mounts.
9. Install front mounts and torque to specifications.
10. Install front mount bracket to transmission with the spacer (if used) on the one 7/16" bolt, then torque bolts to specifications.
11. Raise engine until weight is on front mount bracket, and install nuts and torque to specifications, then install cotter key.
12. Connect emergency brake return spring.
13. On engines equipped with synchromesh transmission, connect shift rod coupling to transmission shift rod then install clutch lever ball stud in front mount bracket.

    On engines equipped with Powerglide transmission, connect control cable.
14. Remove engine lift and Tool J-7894 from under engine.

Rear Mount (Fig. 28)

Replacement

1. Place engine lift, with Tool J-7894 attached, under engine.
2. Remove grille and rear center shield, then disconnect rear mount from rear mount bracket.
3. Lower engine enough to release weight from rear mount.
4. Remove four bolts attaching mount to body, then remove mount.
5. Install rear mount and torque to specifications.
6. Raise engine until weight is on rear mount then install spacer and nuts and torque to specifications.
7. Install rear center shield and grille.
8. Remove engine lift and Tool J-7894 from under engine.

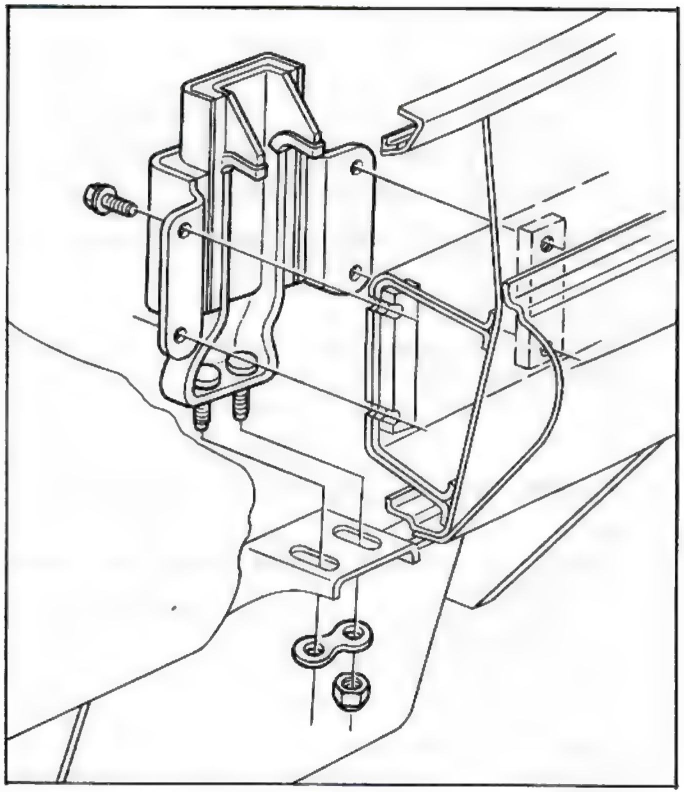


Fig. 28—Rear Mount

CRANKCASE COVER AND BLOWER BEARING

Removal

1. Remove upper shroud as outlined.
2. Remove retaining bolts from blower pulley and remove blower pulley and blower from blower bearing hub assembly.
3. Remove crankcase vent tube retainer, crankcase vent tube and crankcase vent tube "O" ring seal. Discard "O" ring seal.
4. Remove crankcase cover bolts and flat washers.
5. Remove crankcase cover and blower bearing assembly as a unit.
6. Remove crankcase vent and both crankcase cover gaskets. Discard gaskets.

Blower Bearing Replacement (Fig. 29)

1. While supporting crankcase cover, press blower bearing shaft out of cover.
2. Coat new blower bearing shaft with hypoid lubricant, then while supporting crankcase cover, press blower bearing hub assembly into crankcase cover to specified height.

   CAUTION: Press on shaft of blower bearing. Do not press on bearing outer race or bearing seal.

Installation

1. Clean gasket surfaces on crankcase, crankcase vent and crankcase cover.
2. Install crankcase cover gasket and crankcase vent then second crankcase cover gasket.

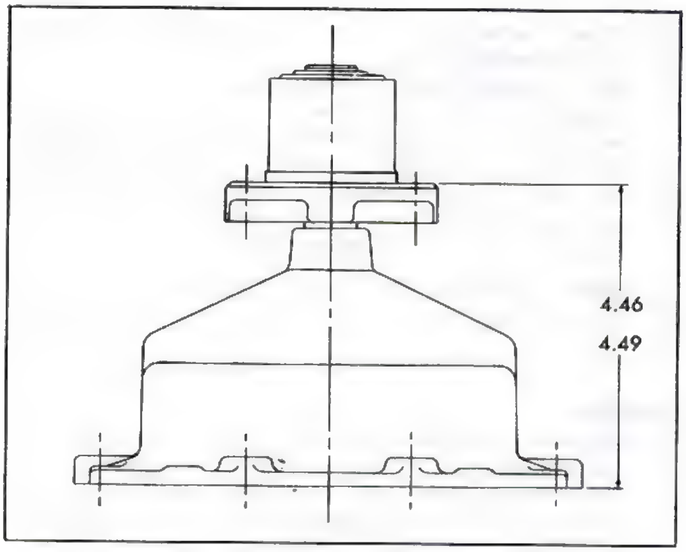


Fig. 29—Blower Bearing Replacement

3. Install crankcase cover and torque bolts to specifications.
4. Install crankcase vent tube using a new "O" ring seal.
5. Install blower and blower pulley and torque to specifications.
6. Install upper shroud as previously outlined.

OIL FILTER AND DELCOTRON ADAPTER

Removal

1. Remove blower belt.
2. Disconnect and remove Delcotron.
3. Disconnect fuel lines at fuel pump.
4. Remove bolts around oil filler tube, then remove all remaining bolts from adapter.
5. Remove adapter with fuel pump, oil filter, idler pulley and belt guide as a unit.
6. Remove adapter gasket and discard.

Installation

1. Check surface of engine rear housing and adapter for nicks or cracks.
2. Install a new adapter gasket.
3. Place bolts and flat washers (3) in adapter around oil filler tube.
4. Start fuel pump push rod and return spring into push rod guide.
5. Hold adapter cover in place and tighten bolts around oil filler tube finger tight.
6. Install remaining bolts and flat washers and torque all bolts to specifications.
7. Install and connect Delcotron.
8. Connect fuel lines at fuel pump.
9. Start engine and check for leaks.

Oil Cooler (Fig. 30)

Removal

1. Remove oil cooler access hole cover.
2. Remove all screws and bolts retaining oil cooler to shroud, shield and cylinder head.
3. Remove oil cooler mounting bolt and then remove oil cooler and seals. Discard seals.

Installation

1. Install new oil cooler seals in place on oil cooler adapter.
2. Install oil cooler and torque to specifications.
3. Install all screws and bolts to shroud, shield and cylinder head, then tighten securely.
4. Install oil cooler access hole cover.
5. Start engine and check for leaks.

OIL PUMP

Gear Removal

1. Drain engine oil.
2. Install engine jack, with Tool J-7894 attached, under engine with a piece of hardwood positioned between the oil pan rails adjacent to engine skid plate.

   NOTE: Installation of hardwood block will allow removal of engine skid plate.

3. Remove grille and rear center shield and disconnect rear mount, then lower engine approximately 1" (to clear rear mount bracket).
4. Remove rear mount bracket and engine skid plate.
5. Remove oil pump cover and gasket. Discard gasket.

   NOTE: Refer to Repair Procedures, Engine Rear Housing for oil pump repair.

Gear Installation

1. Install oil pump gears, then using a new gasket install oil pump gear cover and torque to specifications.
2. Install skid plate and rear mount bracket and torque nuts to specifications.
3. Raise engine, connect rear mount and torque to specifications.
4. Install rear center shield and grille.
5. Remove lifting jack, Tool J-7894 and hardwood block.
6. Fill with oil, start engine and check for leaks.

Pressure Regulator Removal

1. Drain engine oil.
2. Remove left lower shroud and left exhaust duct.

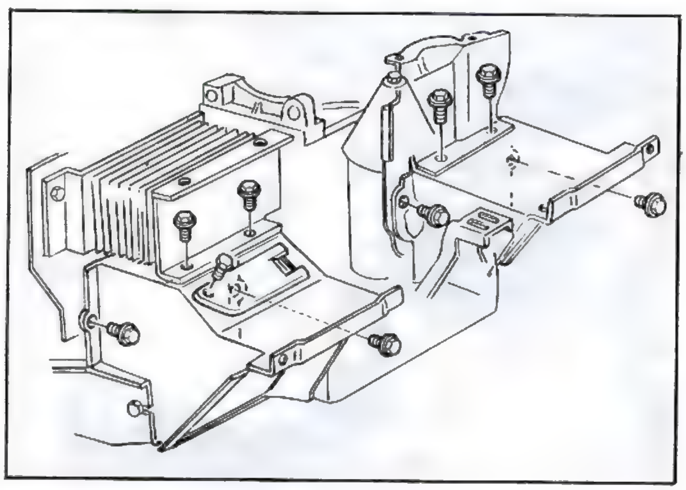


Fig. 30—Oil Cooler and Exhaust Ducts

3. Remove pressure regulator plug, gasket, spring and valve.

   NOTE: Refer to Repair Procedures, Engine Rear Housing for pressure regulator valve repair.

Pressure Regulator Installation

1. Install pressure regulator valve, spring, gasket and plug, then torque to specifications.
2. Install left exhaust duct and left lower shroud.
3. Fill with oil, start engine and check for leaks.

   NOTE: To check oil pressure regulator, remove oil pressure sending unit and connect oil pressure gauge. Accelerate engine until oil pressure gauge stops increasing. Oil pressure regulator should regulate at 35 psi.

OIL PAN

Removal and Installation

1. Drain engine oil, remove oil pan and gasket. Discard gasket.
2. Clean gasket surfaces on oil pan and crankcase with cleaning solvent.
3. Install oil pan with a new gasket. Torque retaining bolts to specifications.
4. Fill with oil, start engine and check for leaks.

OIL PICK-UP SCREEN AND TUBE

Replacement

1. Remove oil pan as outlined.
2. Remove clamp and bracket from tube.
3. Remove and replace oil pick-up screen and tube as outlined under Repair Procedures, Crankcase.
4. Install bracket and torque bolts to specifications.
5. Install oil pan as outlined.
6. Fill with oil, start engine and check for leaks.

CRANKSHAFT PULLEY OR HARMONIC BALANCER

Removal

1. Disconnect engine seal from rear center shield and the rear half of the left and right side shield flanges.
2. Remove blower belt and oil filter.

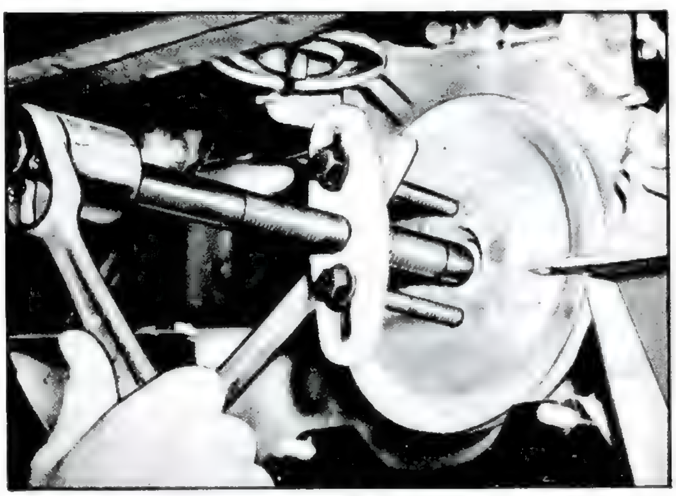


Fig. 31—Removing Crankshaft Pulley

3. Drain engine oil, then place engine jack with Tool J-7894 under engine.
4. Remove grille and rear center shield.
5. Disconnect engine rear mount, then lower engine far enough to remove engine rear mount bracket and remove rear mount bracket.
6. Remove crankshaft pulley or harmonic balancer retaining bolt then install Tool J-8105 on crankshaft pulley or harmonic balancer (fig. 31).

   NOTE: Install puller bolts only 1/4", otherwise the bolts may injure rear housing seal.

7. Remove crankshaft pulley or harmonic balancer.

Installation

1. Position crankshaft pulley or harmonic balancer on end of crankshaft with key lined up.
2. Using retaining bolt and flat washer, pull crankshaft pulley or harmonic balancer in place, then back bolt out 1/2 turn and torque to specifications.

   CAUTION: Do not drive crankshaft pulley or harmonic balancer onto crankshaft. To do so may damage crankshaft thrust bearing and crankcase.

3. Install engine rear mount bracket and torque nuts to specifications.
4. Raise engine and connect rear mount, then torque to specifications.
5. Remove engine jack and Tool J-7894.
6. Install rear center shield and grille.
7. Install new oil filter and torque to specifications.
8. Install blower belt and adjust as outlined.
9. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
10. Fill with oil, start engine and check for leaks.

ENGINE REAR HOUSING SEAL

Replacement

1. Remove crankshaft pulley or harmonic balancer as outlined.
2. Remove seal by prying on outer edge of seal with two screw drivers, then discard seal.
3. Install new seal over crankshaft and tap in place with a block of hardwood.
4. Install crankshaft pulley or harmonic balancer as outlined.

ENGINE REAR HOUSING

Removal

1. Remove distributor cap and note position of rotor, then disconnect and remove distributor.
2. Remove oil filter and Delcotron adapter as outlined.
3. Drain engine oil.
4. Install engine lift with Tool J-7894 attached, under engine with a piece of hardwood positioned between the oil pan rails adjacent to engine skid plate.

   NOTE: Installation of hardwood block will allow removal of engine skid plate.

5. Remove rear center shield and disconnect rear mount, then lower engine approximately 1" (to clear rear mount bracket).

6. Remove rear mount bracket and engine skid plate.
7. Remove crankshaft pulley or harmonic balancer as outlined.
8. Remove engine rear housing assembly.

NOTE: Refer to Repair Procedures, Engine Rear Housing for service to engine rear housing.

Installation

1. Install engine rear housing and torque bolts to specifications.
2. Install crankshaft pulley or harmonic balancer as outlined.
3. Install engine skid plate and rear mount bracket and torque nuts to specifications.
4. Raise engine and connect engine rear mount then torque to specifications.
5. Install rear center shield.
6. Remove engine lift, Tool J-7894 and hardwood block.
7. Install oil filter and Delcotron adapter as outlined.
8. Install distributor in the same position as when removed then install distributor cap.
9. Fill with oil, start engine, check and adjust timing and check for oil leaks.

DISTRIBUTOR DRIVE GEAR AND/OR FUEL PUMP ECCENTRIC

Replacement

1. Remove engine rear housing as outlined.
2. Remove distributor drive gear with Tool J-7112-1 and adapter Tool J-7112-2, then remove spacer and fuel pump eccentric.

CAUTION: Be sure Tool J-7112-1 is on distributor drive gear solidly, or gear may be damaged during removal.

3. Be sure woodruff keys (2) are installed in crankshaft, then position fuel pump eccentric and spacer on crankshaft.
4. Lubricate crankshaft and distributor drive gear with engine oil and using Tool J-5590 install distributor drive gear until it bottoms.
5. Install engine rear housing as outlined.

VALVE LIFTERS (Valve Train Components)

Hydraulic valve lifters very seldom require attention. The lifters are extremely simple in design, readjustments are not necessary, and servicing of the lifters require only that care and cleanliness be exercised in the handling of parts.

Locating Noisy Lifters

Locate a noisy valve lifter by using a piece of garden hose approximately four feet in length. Place one end of the hose near the end of each intake and exhaust valve with the other end of the hose to the ear. In this manner, the sound is localized making it easy to determine which lifter is at fault.

Another method is to place a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a distinct shock will be felt when the valve returns to its seat.

The general types of valve lifter noise are as follows:

1. Hard Rapping Noise—Usually caused by the plunger becoming tight in the bore of the lifter body to such an extent that the return spring can no longer push the plunger back up to working position. Probable causes are:
   a. Excessive varnish or carbon deposit causing abnormal stickiness.
   b. Galling or "pick-up" between plunger and bore of lifter body, usually caused by an abrasive piece of dirt or metal wedging between plunger and lifter body.
2. Moderate Rapping Noise—Probable causes are:
   a. Excessively high leakdown rate.
   b. Leaky check valve seat.
   c. Improper adjustment.
3. General Noise Throughout the Valve Train—This will, in almost all cases, be a definite indication of insufficient oil supply, or improper adjustment.
4. Intermittent Clicking—Probable causes are:
   a. A microscopic piece of dirt momentarily caught between ball seat and check valve ball.
   b. In rare cases, the ball itself may be out-of-round or have a flat spot.
   c. Improper adjustment.

In most cases where noise exists in one or more lifters all lifter units should be removed, disassembled, cleaned in a solvent, reassembled, and reinstalled in the engine. If dirt, varnish, carbon, etc. is shown to exist in one unit, it more than likely exists in all the units, thus it would only be a matter of time before all lifters caused trouble.

Removal

1. Drain engine oil, then remove lower shrouds as outlined. For the right bank, remove muffler heat shield.
2. Remove valve rocker arm covers and discard gaskets.
3. Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they may be installed in their original location.
4. Remove rocker arm studs and push rod guides, then remove and discard rocker arm stud "O" ring seals (fig. 32).
5. Pull push rod tubes from crankcase bore and remove and discard inner "O" ring seal, (fig. 33), then remove push rod tube from cylinder head and remove and discard outer "O" ring seal.

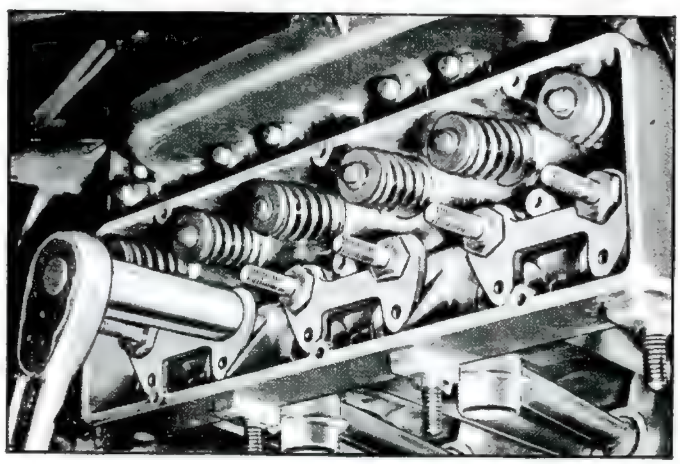


Fig. 32—Rocker Arm Studs and Push Rod Guides

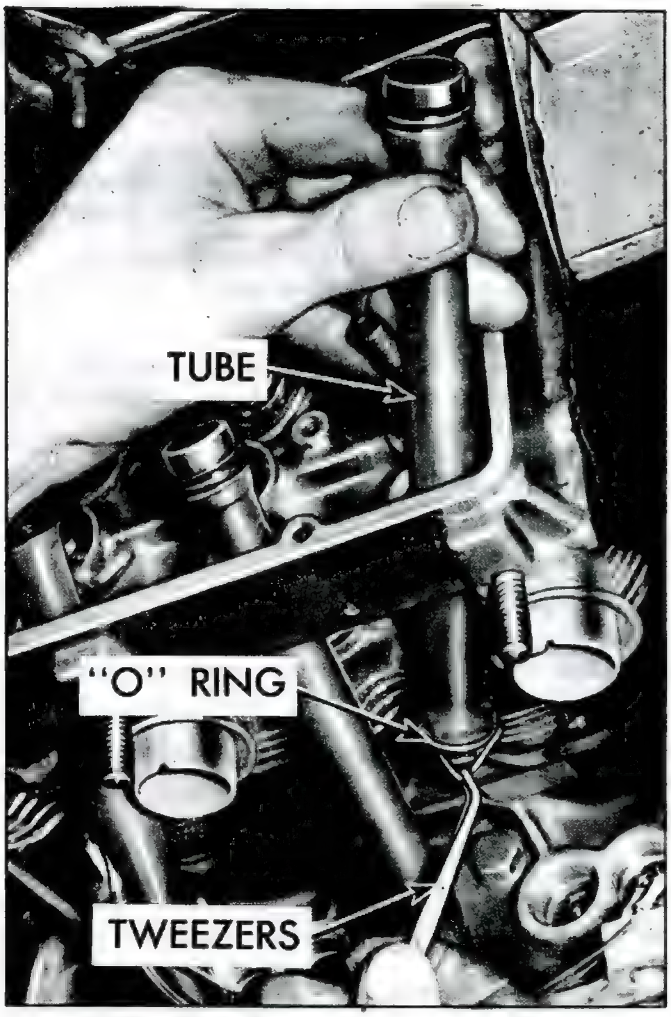


Fig. 33—Removing Push Rod Tubes

6. Remove valve lifters with a strong magnet or a wire hook. Place valve lifters in a rack so they may be reinstalled in their original location.

Installation and Adjustment

1. Lubricate valve lifters and install in crankcase bore.

   NOTE: Whenever new valve lifters are installed, coat foot of lifter with Molykote or its equivalent.

2. Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes, then install push rod tubes through bore in cylinder head and install new "O" ring seals, lightly coated with oil, on inner end of push rod tubes.
3. Start push rod tubes into bores in cylinder head and crankcase, then seat the push rod tubes with a 9/16" deep socket (placed against cylinder head end of push rod tube and tapped lightly with a hammer).
4. Install new "O" ring seals, lightly coated with oil, into rocker arm stud bore in cylinder head.
5. Install push rod guides, then rocker arm studs.
6. Torque rocker arm studs to 10 ft. lb. below specifications, then torque cylinder head nuts and rocker arm studs a little at a time in the sequence shown (fig. 34) until the specified torque is reached.
7. Install push rods with the side oil hole out (fig. 35).
8. Install valve rocker arms, rocker arm balls and rocker arm nuts.

   NOTE: Whenever new valve rocker arms and rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent. (Install new rocker arms and balls in sets).

9. Adjust the valves as follows:

   Remove distributor cap and rotate crankshaft counter-clockwise until number 1 cylinder is at T.D.C. of compression stroke rotor pointing to number 1 cylinder position and timing mark at 0 on the tab), then adjust No. 1 intake, No. 1 exhaust, No. 3 intake and No. 5 exhaust on the right bank and No. 4 exhaust and No. 6 intake on the left bank.

   NOTE: Turn adjusting nut out until there is end play in the push rod, then turn adjusting nut in until there is no end play at push rod. Turn adjusting nut one additional turn in (to center plunger in hydraulic valve lifter)

   Turn crankshaft one turn counter-clockwise (number 2 cylinder at T.D.C. of compression stroke and timing mark at 0 on tab), then adjust the valves on No. 3 exhaust and No. 5 intake on the right bank and No. 2 intake, No. 2 exhaust, No. 4 intake and No. 6 exhaust on the left bank.

10. Using new gaskets, install the valve rocker covers and torque to specifications (fig. 36).
11. Install lower shrouds and muffler heat shield as outlined.
12. Fill with oil, start engine and check for leaks.

CYLINDER HEAD ASSEMBLIES

Removal

1. Drain engine oil, then disconnect battery positive cable.
2. Remove spare tire, then remove air cleaner assembly.
3. Remove the following items from the cylinder head to be removed.

   Carburetor, carburetor mounting studs and upper choke control rods.

   Ignition coil and bracket (right cylinder head).

   Side shield, lower shroud and exhaust duct.

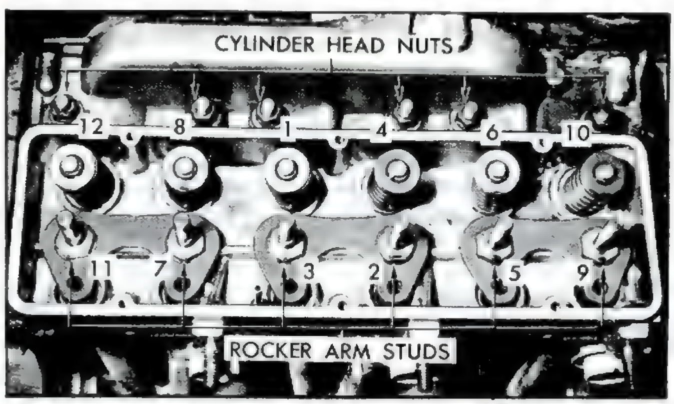


Fig. 34—Cylinder Head Torque Sequence

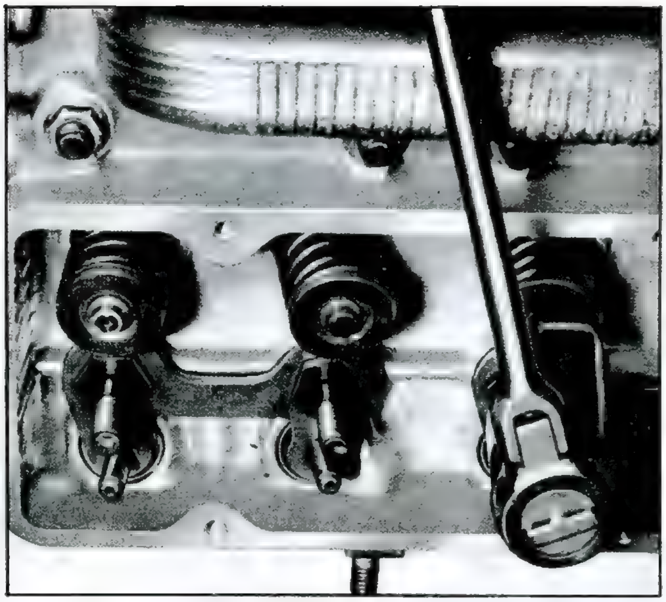


Fig. 35—Push Rods Installed

Oil cooler (left cylinder head).

Muffler, muffler shield and muffler hanger (right cylinder head).

Spark plugs and vacuum balance tube hose at cylinder head.

Bolts attaching upper shroud to front and rear shrouds and bolts attaching front and rear shrouds to cylinder head.

Exhaust manifolds.

NOTE: On left rear shroud, it will be necessary to disconnect heater hose at elbow to gain access to one bolt.

4. On the right cylinder head, disconnect wire to cylinder head temperature sending unit.
5. Remove cylinder head assembly as follows:

Remove valve rocker arm cover and discard gasket.

Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they may be installed in their original location.

Remove rocker arm studs and push rod guides, then remove and discard rocker arm stud "O" ring seals.

Pull push rod tubes from crankcase bore and remove and discard inner "O" ring seal, then remove push rod tube from cylinder head and remove and discard "O" ring seal. Remove cylinder head nuts, then remove cylinder head assembly from crankcase studs and discard cylinder head gaskets.

Installation

1. Install cylinder head assembly as follows:

Place cylinder head gasket in cylinder head combustion chamber.

Install cylinder head assembly over studs and carefully guide into place.

Install 6 cylinder head nuts (finger tight).

Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes, then install push rod tubes through bore in cylinder head and install new "O" ring seals, lightly coated with oil, on inner end of push rod tubes.

Start push rod tubes into bores in cylinder head and crankcase, then seat the push rod tubes with a 9/16" deep socket (placed against cylinder head end of push rod tube and tapped lightly with a hammer).

Install new "O" ring seals, lightly coated with oil into rocker arm stud bore in cylinder head.

Install push rod guides, then rocker arm studs (finger tight).

Torque cylinder head nuts and rocker arm studs, a little at a time, in the sequence shown (fig. 34) until the specified torque is reached.

Install push rods with the side oil hole out.

Install rocker arms, rocker arm balls and rocker arm nuts.

NOTE: Whenever new rocker arms or rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent.

2. Connect wire to cylinder head temperature sending unit on right cylinder head.
3. Adjust valves as outlined under Valve Lifters.
4. Using a new gasket, install valve rocker cover and torque to specifications.
5. Install the following items as outlined.

Exhaust manifold.

Bolts attaching front and rear shroud to cylinder head and bolts attaching upper shroud to front and rear shroud.

Spark plugs and vacuum balance tube hose.

Muffler hanger, muffler heat shield, and muffler (right cylinder head).

Oil cooler (left cylinder head).

Exhaust duct, lower shroud and side shield.

Ignition coil and bracket (right cylinder head).

Carburetor mounting studs, carburetor and choke control rods.

6. Fill with oil, then connect battery positive cable.
7. Synchronize carburetors as outlined in Engine Tune-up.
8. Check for oil leaks.
9. Install air cleaner assembly and spare tire.

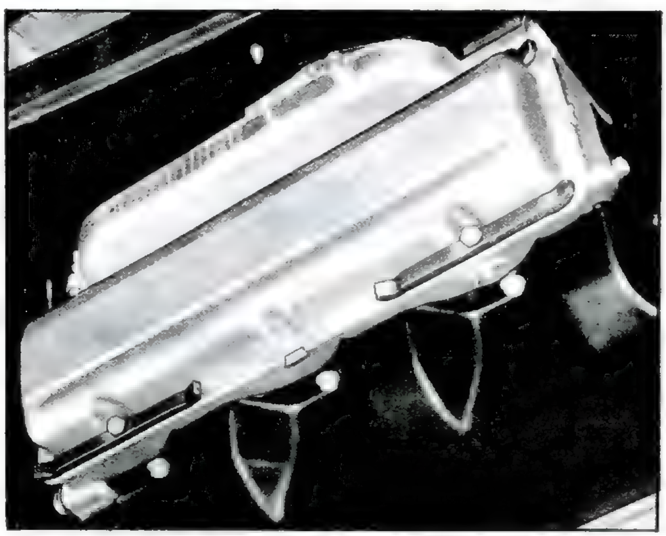


Fig. 36—Rocker Arm Cover Installed

VALVE SPRINGS AND/OR VALVE STEM OIL SEALS

NOTE: Intake valves on all Corvair engines are provided with valve stem oil seals. Valve springs and/or valve stem oil seals can be replaced with the cylinder head installed.

Replacement

1. Remove the spark plug, valve rocker cover, rocker arm nut, rocker arm ball, rocker arm and push rod on the cylinder to be serviced.
2. Apply compressed air to the spark plug hole to hold the valve in place.

   NOTE: A tool to apply air to the cylinder is available through loeal jobbers or may be manufactured (fig.37).

3. Using Tool J-5892 to compress the valve spring, remove the valve locks, valve cap and valve spring and damper assembly.
4. If valve stem oil seal on intake valve is to be replaced, remove seal from valve guide.
5. Check valve spring installed height as follows.
   Install the spring cap and valve locks without the spring.
   Hold the spring cap and pull the valve against the seat, then measure the distance between spring cap and spring seat (fig. 38).

   NOTE: This locates the spring cap in the installed position.

6. Remove valve locks and spring cap and, if necessary, shim spring.

   NOTE: Spring shims are available in .030" thickness. Do not shim if shim will bring installed height below minimum specification.

7. On intake valves, install new valve stem oil seal using special plastic protector sleeve to prevent seal damage as seal passes over the valve lock grooves. Push seal on guide until it bottoms on guide end.
8. Place the valve spring and damper assembly and valve cap in place.

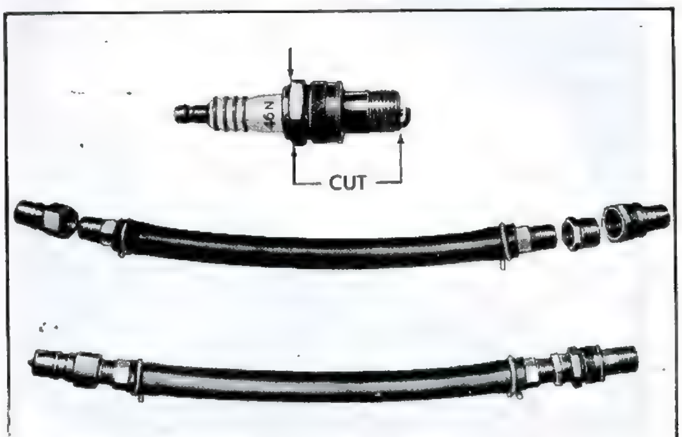


Fig. 37—Air Adapter Tool

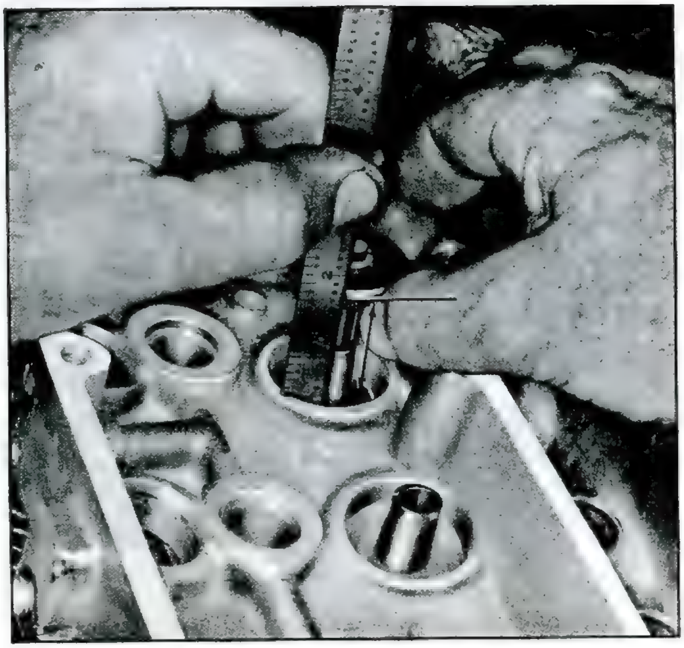


Fig. 38—Measuring Valve Spring Installed Height

9. Compress the valve spring with Tool J-5892 and install valve cap and valve locks, then release the compressor tool making sure the lock seats properly.

   NOTE: Grease may be used to hold the locks in place while releasing the compressor tool.

10. Install spark plug with a new gasket, then install valve rocker arm, rocker arm ball and rocker arm nut and adjust valve as outlined under Valve Lifters.
11. Using a new gasket, install the valve rocker cover and torque to specifications.

CONNECTING ROD BEARINGS

Replacement

1. Remove upper shroud and crankcase cover as outlined.
2. Position connecting rod for removal of cap.
3. Remove connecting rod nuts, then remove connecting rod cap.
4. Install a piece of 5/16" I.D. plastic or rubber hose on connecting rod bolt, to protect crankshaft journals, (fig. 39).
5. Remove spark plug from cylinder being serviced and position connecting rod so bearing may be removed.
6. Remove bearing from connecting rod and connecting rod cap.

   NOTE: Refer to Repair Procedures, Connecting Rod Bearing for clearances and bearing selection.

7. Lubricate and install bearing in connecting rod and connecting rod cap.
8. Install connecting rod cap and torque to specifications.
9. Install spark plug with a new gasket and torque to specifications.

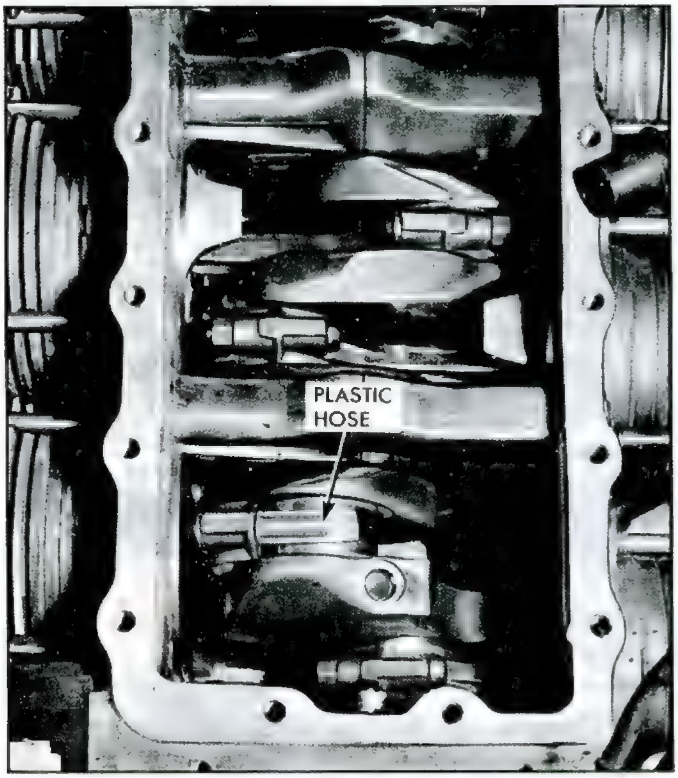


Fig. 39—Connecting Rod Bearing Replacement

10. Install crankcase cover and upper shroud as outlined.

PISTON RING AND/OR CYLINDER GASKET

Replacement

Cylinders and pistons are serviced as a unit and the operation outlined below, is only for one or more cylinders in one bank, requiring ring or gasket replacement. The operation below is not intended for complete engine (piston ring) overhaul.

1. Drain engine oil and remove cylinder head, then remove cylinder air baffle.
2. Remove cylinder from piston requiring piston ring, or cylinder gasket replacement.
3. If removed for ring replacement, replace rings on piston as outlined in Repair Procedures, Piston Rings.

   CAUTION: Positioning of ring gaps is very important (To prevent oil consumption and to permit installation of the notched cylinder over the piston rings). Ring gaps must not line up with the notch in the cylinder.

4. Lubricate piston rings with engine oil and slide Tool J-8356 over piston rings. Tighten Tool J-8356 just enough to compress piston rings (fig. 40).
5. Install a new cylinder gasket over cylinder pilot and slide cylinder over piston and piston rings. Remove Tool J-8356, by unhooking clamp and pulling from piston assembly (fig. 41).
6. Install cylinder air baffle.
7. Install cylinder head as outlined.
8. Fill with oil, start engine and check for leaks.

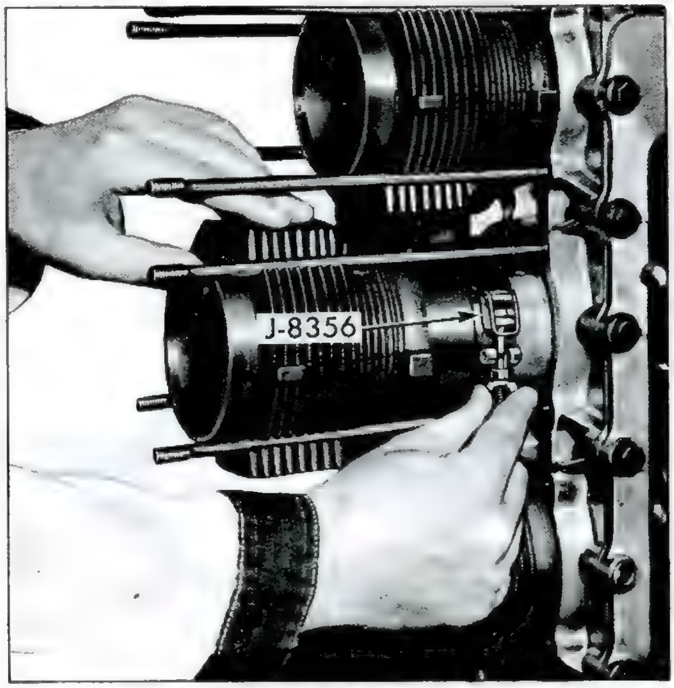


Fig. 40—Compressing Piston Rings

CAMSHAFT

Measuring Lobe Lift (At Push Rod)

This procedure is similar to that used for checking valve timing. Measure the lift of each lobe in consecutive order and record the readings.

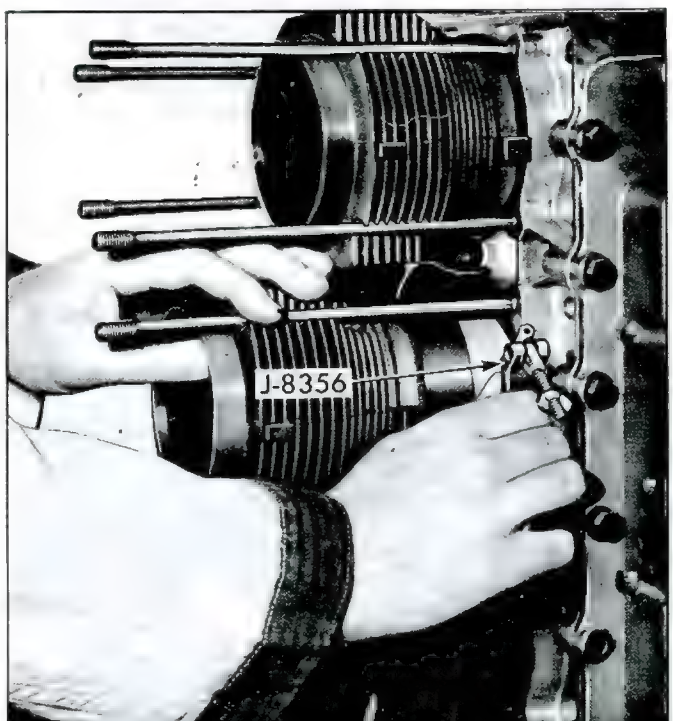


Fig. 41—Removing Tool from Piston Assembly

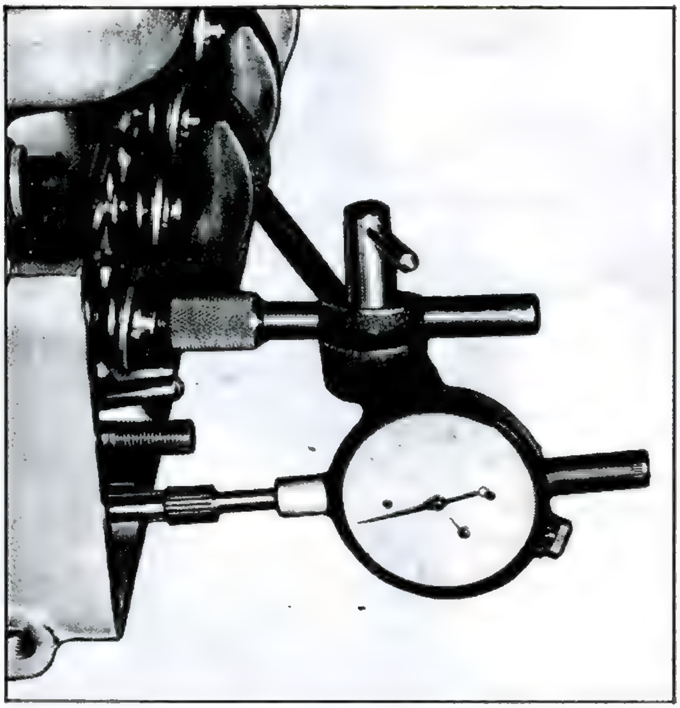


Fig. 42—Measuring Camshaft Lobe Lift

1. Drain crankcase oil and remove valve covers and discard gaskets.
2. Remove valve rocker arms, rocker arm balls and rocker arm nuts. Install adapter provided in Tool J-8520 on the valve rocker stud at desired cylinder to be measured and attach dial indicator.

   NOTE: Tool J-8520 holding fixture (having a 3/8"-24 tapped hole) must be installed on the opposite valve rocker stud, than the camshaft lobe to be measured. To measure exhaust lobe lift, install Tool J-8520 on the inlet valve rocker stud.

3. Remove spark plugs and discard gaskets.
4. Install the push rod in place and make sure the push rod is in the lifter socket and adapter on Tool J-8520 (fig. 42).
5. Crank engine until the lifter rests on the heel of the camshaft lobe. At this point the push rod is in its lowest position. Set the dial indicator on zero, then crank the engine until the push rod is in its fully raised position and note the total lift recorded on the indicator. Continue to rotate the crankshaft until the indicator reads zero. This will check the original indicator reading.
6. If the reading on any lobe is below specifications the camshaft and lifters should be replaced as outlined under Engine Disassembly.
7. If camshaft readings for all lobes are within specifications, remove dial indicator and adapter Tool J-8520.
8. Install valve rocker arms, rocker arm balls and rocker arm nuts and adjust valves as outlined under Valve Lifters.
9. Install valve covers using new gaskets.
10. Install spark plugs using new gaskets (clean plugs if necessary).
11. Fill with oil, start engine and check for leaks.

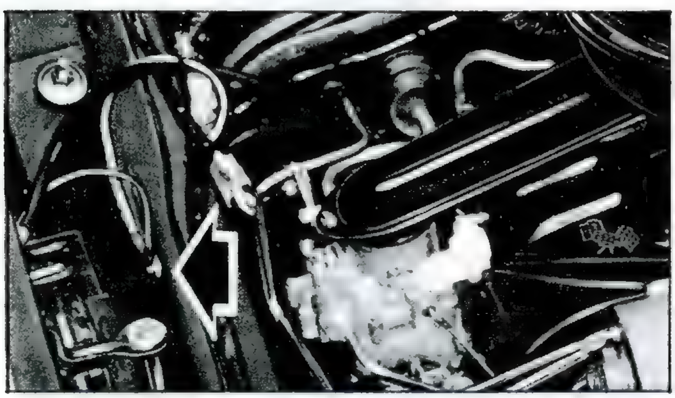


Fig. 43—Electrical Disconnect

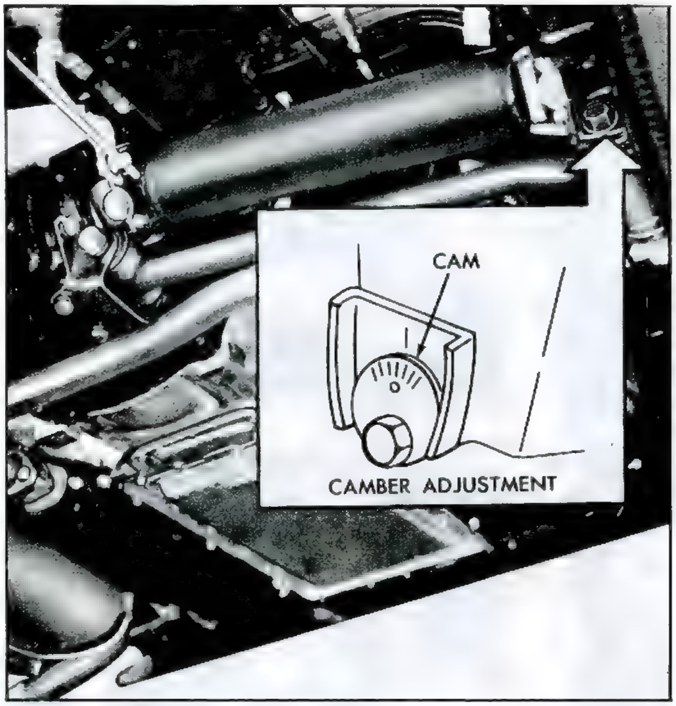


Fig. 44—Rear Strut Rod and Cam Adjustment

ENGINE ASSEMBLIES (POWER TRAIN)

Removal

1. Remove spare tire.
2. Disconnect heater hose at upper shroud.
3. Disconnect engine seal from engine shields.

   NOTE: Disconnect seal by grasping at lower edge, then pulling up and off the shield flange.

4. Remove axle dip stick.
5. Disconnect the following electrical items:
   Battery positive cable terminal and 10 gauge red wire at terminal on body side rail (fig. 43).
   Battery negative cable at Delcotron bracket.
   Starter wiring at quick disconnect.
   Cylinder head temperature and oil pressure indicator wire at quick disconnect.

Positive wire at ignition coil.

If so equipped, radio ground straps at left and right engine shields.

6. Raise vehicle, then remove grille and rear center shield.
7. Disconnect fuel line at flexible hose then plug line from tank.
8. Disconnect heater hoses at elbows on left and right front shrouds.
9. Disconnect accelerator control rod at idler lever on transmission.
10. Index adjustment cam on outer end of rear strut rods (fig. 44), then loosen nut (do not turn bolt).

NOTE: This will aid in disconnecting and connecting rear strut rod at differential carrier.

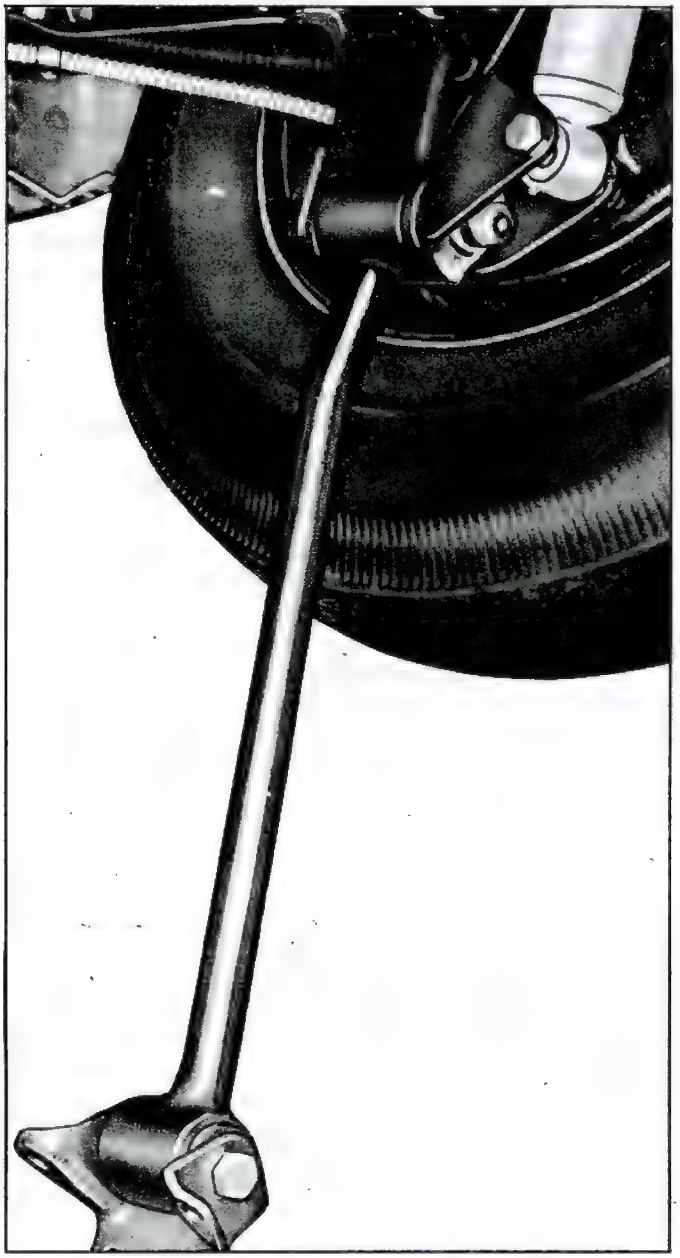


Fig. 45—Rear Strut Rod Lowered

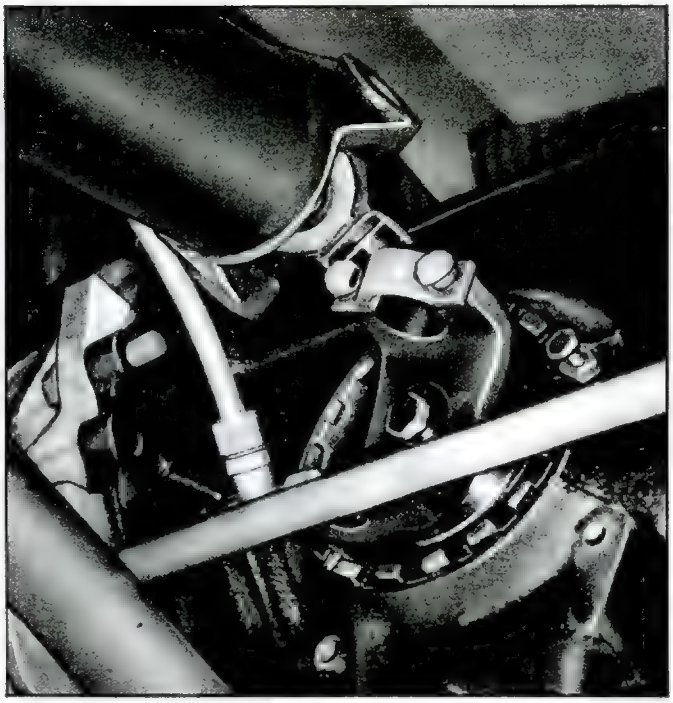


Fig. 46—Rear Axle Disconnected

11. Disconnect left and right rear strut rod brackets from differential carrier (fig. 45), then swing rods down.
12. Disconnect inner universal joints (fig. 46).
13. On automatic transmission equipped vehicles, disconnect transmission shift cable.

NOTE: Disconnect transmission shift cable by removing bolt retaining cable at transmission case, then rotate throttle lever its full limit clockwise and pull cable from transmission case.

14. On synchromesh transmission equipped vehicles: Disconnect shift tube coupling at transmission shifter shaft.

Disconnect clutch return spring, then disconnect clutch rod from clutch cross shaft.

If so equipped, disconnect back up lamp switch from 4-speed transmission.

15. Remove 3/8" bolt from bottom of skid plate then place engine lift, with Tool J-7894 attached, under engine and support weight of engine.
16. Remove nuts from engine rear mount, then remove bolts attaching front mount bracket to transmission case (fig. 47).

CAUTION: Do not loose spacer on synchromesh transmission equipped vehicles. Spacer is located on right bolt between transmission case and front mount bracket.

17. Slowly lower power train being sure all disconnects have been made and checking for interference, then remove power train from under vehicle.
18. Remove exhaust pipe and muffler as an assembly.
19. Remove transaxle (and clutch) as follows:

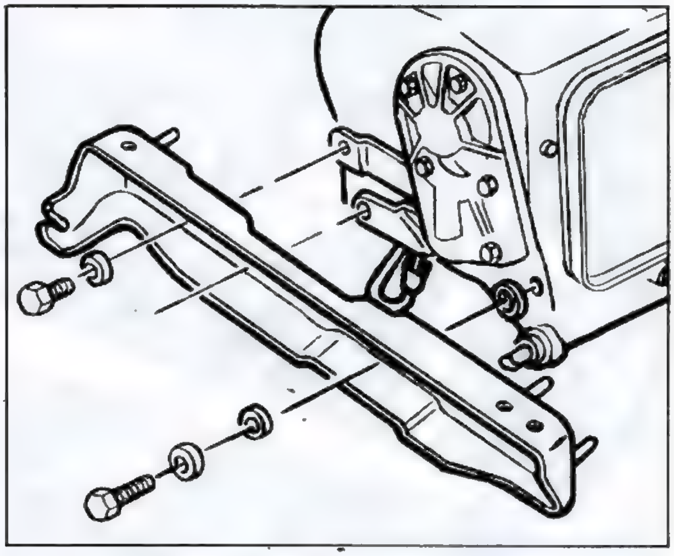


Fig. 47—Front Mount Bracket Bolts

SYNCHROMESH

a. Using the engine lift, lower power train until transaxle rests on suitable blocks to support weight of transaxle.
b. Disconnect starter wiring and remove starter.
c. Remove the two bolts securing the clutch rod dust seal assembly, then remove the pin attaching the rod to the clutch fork.
d. Separate the transaxle from the engine by removing the attaching bolts securing the differential carrier to the flywheel housing. Pull engine away horizontally.
e. Loosen clutch mounting bolts a turn at a time (to prevent distortion of clutch cover) until the spring pressure is released. Remove all bolts, clutch disc and pressure plate assembly.

AUTOMATIC

a. Drain transmission by disconnecting transmission filler tube.
b. Disconnect hose from vacuum modulator.
c. Disconnect starter wiring and remove starter.
d. Disconnect the converter from the engine flex plate by removing the three attaching bolts through the access hole at the 12 o'clock position in the converter housing (fig. 48). The converter may be rotated by prying against the starter gear teeth on the converter housing with a screw driver.
e. Using the engine lift, lower power train until transaxle rests on suitable blocks to support weight of transaxle.
f. Separate the transaxle from the engine by removing the attaching bolts securing the differential carrier to the flywheel housing. Pull engine away horizontally.

Installation

1. Install transaxle (and clutch) on engine as follows:

SYNCHROMESH

a. Install clutch on flywheel as outlined in Section 7.
b. Position the engine (on engine lift) adjacent to the transaxle and with the clutch shaft in place in the transaxle align the clutch shaft to clutch splines and align the differential carrier and flywheel housing.
c. Pilot the clutch shaft into the clutch and install all bolts securing transaxle to flywheel housing.
d. Connect the clutch rod to the clutch fork with pin, then position and secure the clutch rod dust seal assembly to the clutch housing with two bolts.
e. Install starter and connect wiring.

AUTOMATIC

a. Position the engine (on engine lift) adjacent to the transaxle and align the converter with the flex plate and align the differential carrier to the flywheel housing.
b. Pilot the converter hub into crankshaft and install all bolts securing differential carrier to flywheel housing.
c. Install converter-to-flex plate bolts through the access hole in the converter housing. The converter can be rotated to make the attaching points accessible by turning the converter with a screw driver against its starter gear teeth.
d. Install starter and connect wiring.
e. Connect hose at vacuum modulator.
f. Connect transmission filler tube.

2. Install exhaust pipe and muffler assembly.
3. Place power train under vehicle and raise into position.
4. Install bolts attaching front mount bracket to transmission case. Tighten bolts securely.

NOTE: On synchromesh equipped vehicles be sure and install spacer between front mount bracket and transmission case.

5. Connect rear mount and install nuts and lock washers. Tighten nuts securely.
6. Remove engine lift and Tool J-7894 from under vehicle, then install 3/8" bolt in skid plate.
7. On synchromesh transmission equipped vehicles: Adjust and connect clutch rod and connect clutch return spring.

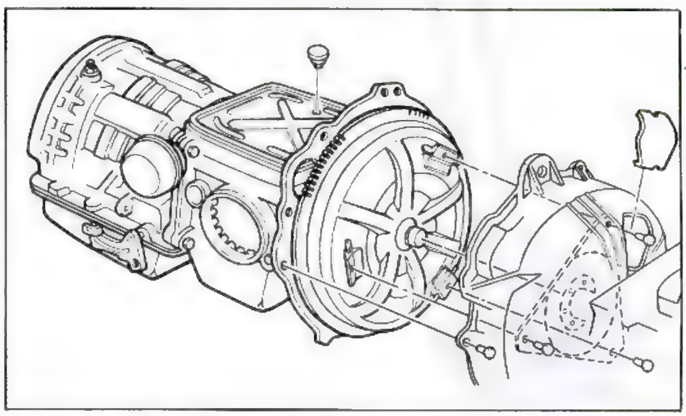


Fig. 48—Transaxle Separated from Engine

Connect shift tube coupling at transmission shifter shaft.

8. On automatic transmission equipped vehicles, connect transmission shift cable.

NOTE: Connect transmission shift cable by rotating throttle lever its full limit counterclockwise and inserting ball end of cable into transmission case until shoulder seats against transmission case, then lock in place with bolt.

9. Connect universal joints.
10. Connect left and right rear strut rod brackets to differential carrier.
11. Connect accelerator control rods at idler lever on transmission.
12. Connect heater hoses at elbows on left and right front shrouds.
13. Connect fuel line at flexible hose.
14. Install rear center shield and grille, then lower vehicle.
15. With vehicle sitting at curb height: Check cam adjusters on outer end of rear strut rod and be sure they are in the same position as indexed, then tighten nut without turning bolt.
16. Connect the following electrical items:
    If so equipped, radio ground straps at left and right engine shields.
    Positive wire at ignition coil.
    Cylinder head temperature and oil pressure indicator wire at quick disconnect.
    Starter wiring at quick disconnect.
    Battery positive cable at battery terminal and 10 gauge red wire at terminal on body side rail.
    Battery negative cable at Delcotron bracket.
17. Install axle dip stick.
18. Lubricate groove of engine seal with liquid soap or silicone then connect seal.

NOTE: While guiding groove of seal on shield flange, (with one hand) press seal in place using block of wood or a hammer handle.

19. Connect heater hose at upper shroud, then install spare tire.
20. If necessary, fill engine with oil, fill transmission and fill axle.
21. Start engine, check fog leaks and perform necessary adjustments.

REPAIR PROCEDURES

ENGINE ASSEMBLIES

Disassembly

1. With engine on lifting jack and Tool J-7894 (as removed from vehicle) and transaxle removed:
    Remove air cleaner assembly.
    Disconnect fuel lines at carburetors and vacuum advance hose at right carburetor.
    Disconnect choke rods at choke levers and remove upper choke control rods.
    Remove carburetors and cross shaft as an assembly.
    Remove blower belt.
    Remove grommet with starting wire from front shield.
    Remove fuel pump and fuel lines as an assembly.
    Remove fuel pump push rod and spring assembly.
    Remove Delcotron and bracket.
    Disconnect positive ventilation tube at top shroud, then remove vacuum balance tube and positive ventilation tube and hoses as an assembly.
    Remove engine front shield.
    Remove oil filter and Delcotron adapter with the oil filter attached. Discard gasket.
2. Bolt lifting adapter to rear of engine and attach a chain and shackle (from Tool J-4536-A) to lifting adapter and to lifting eye at flywheel housing.
3. Remove flywheel (Synchromesh) or flex plate (Automatic).

NOTE: Because of a difference of 1-5/8" between the center line of the crankshaft and the engine rear mounting bracket, a special lifting adapter is required. This adapter, made from angle iron 3" x 3" x 1/4" and mounted as shown (fig. 49), will provide a center line lifting point. point.

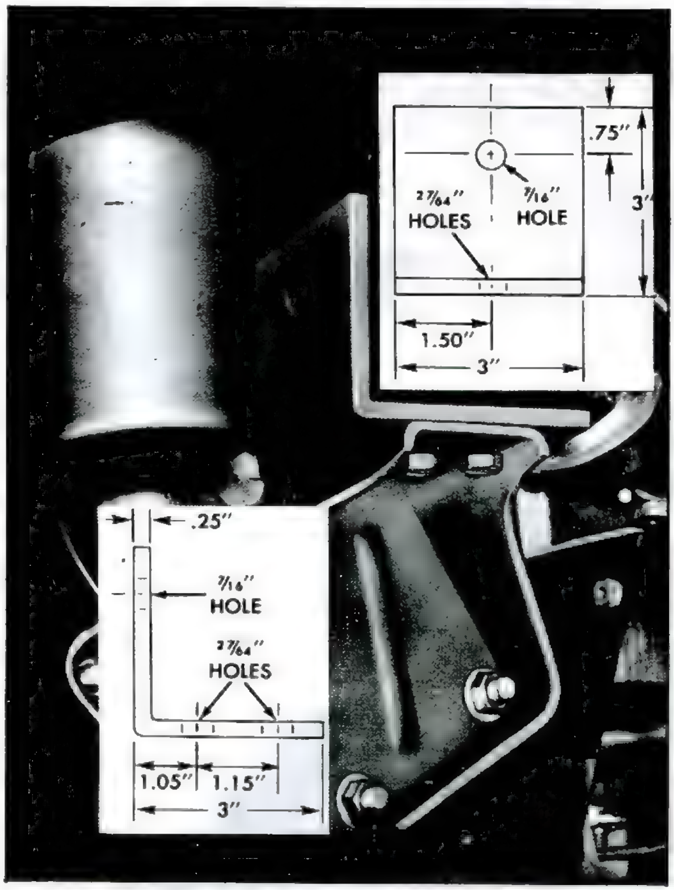


Fig. 49—Lifting Adapter

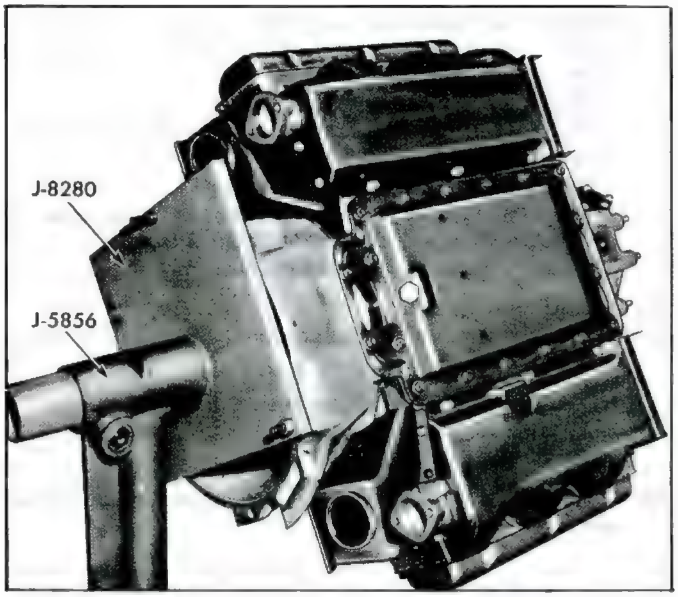


Fig. 50—Engine on Engine Stand

4. Using a chain fall or comparable lift, remove engine from lifting jack and Tool J-7894.
5. Install engine on engine stand (Tool J-5856) by mounting flywheel housing to adapter (Tool J-8280) (fig. 50).
6. Drain engine oil, then:

   Remove distributor cap and spark plug wires as an assembly.

   Remove oil cooler access hole cover and the oil dip stick.

   Remove distributor and ignition coil.

   Remove upper shroud then left and right shields.

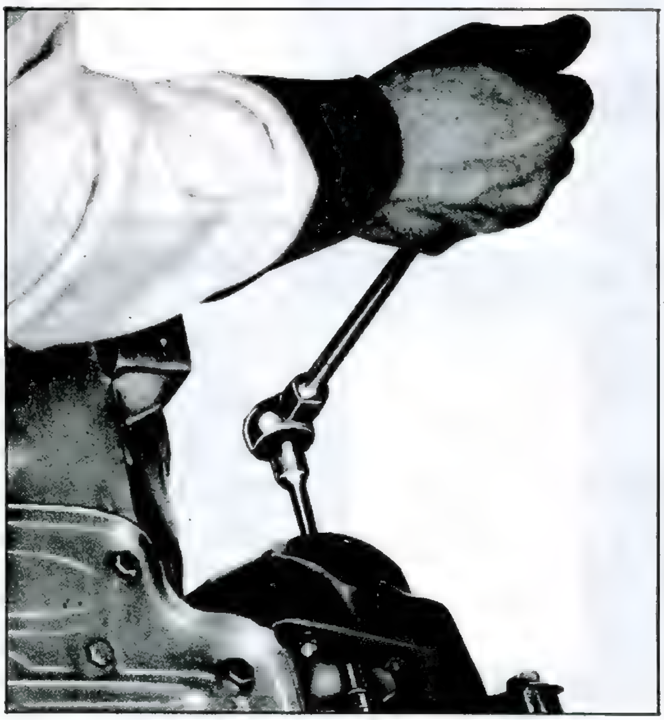


Fig. 51—Removing Left Front Shroud

   Remove oil cooler and discard seals.

   Remove spark plugs and discard gaskets.

   Remove blower pulley and blower.

   Remove crankcase vent tube and discard "O" ring seal, then remove crankcase cover and crankcase vent. Discard gaskets.

7. Invert engine then:

   Remove muffler heat shield, lower shrouds and exhaust ducts.

   Remove left rear shroud then disconnect wire from cylinder head temperature unit and remove right rear shroud and harness as an assembly.

   Remove oil pan and discard gasket.

   Remove exhaust manifolds and discard packings.

   Remove front shroud and elbow assemblies (one left shroud attaching bolt may be reached inside heater elbow) (fig. 51).

   Remove rear mounting bracket and skid plate at engine rear housing.

   Remove valve rocker arm covers and discard gaskets.

8. Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they can be installed in their original location.
9. Remove valve rocker arm studs, then remove push rod guides and discard "O" ring seals.
10. Pull push rod tubes from crankcase bores and remove and discard inner "O" ring seals from push rod tubes, then remove push rod tubes from cylinder head and remove and discard outer "O" ring seals.
11. Remove nuts from cylinder head studs.
12. Remove cylinder head assemblies and discard gaskets.

NOTE: Cylinders will need a holding fixture (Six 4-5/8" lengths and six 3-3/4" lengths of thinwall 1/2" O.D. tubing) if crankshaft is turned with cylinder heads removed.

13. Install one long and one short holding fixture (over a long and a short stud) for each cylinder and retain with cylinder head nuts (fig. 52).

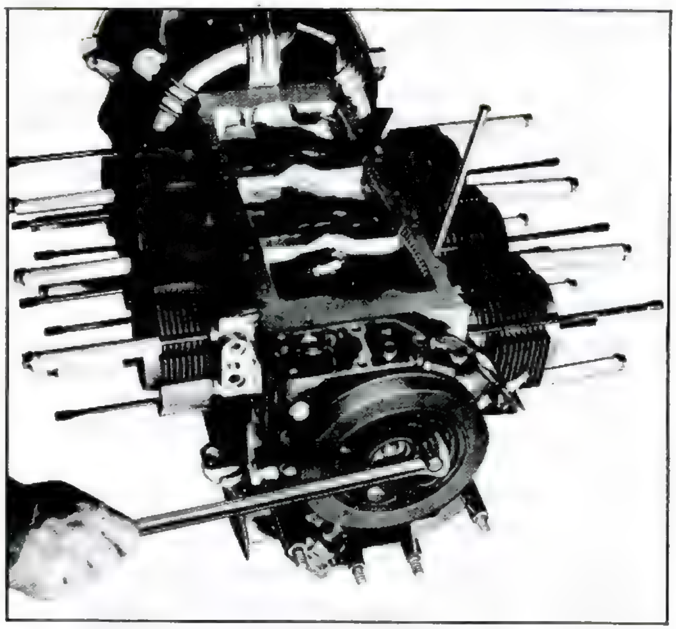


Fig. 52—Cylinder Holding Fixture

14. Remove valve lifters with a magnet or wire hook. Place lifters in a rack so they can be installed in their original location.
15. Invert engine (top up), then remove cylinder air baffles.
16. Remove cylinder, piston and connecting rod assemblies as follows:

    Using a 3/4" wrench on crankshaft bolt, turn crankshaft so number 1 connecting rod cap can be removed.

    Mark connecting rod and connecting rod cap for cylinder identification, if not previously marked.

    NOTE: Cylinders are numbered rear to front; 1-3-5 on the right bank and 2-4-6 on the left bank.

    Remove connecting rod cap and cylinder holding fixture, then remove cylinder, piston and connecting rod as an assembly.

    If connecting rod bearings are to be reused, leave in place in connecting rod and connecting rod cap.

    If connecting rod bearings are to be replaced, remove and discard bearings.

    Install connecting rod cap to connecting rod (finger tight) and remove and discard cylinder gasket.

    Remove the remaining cylinder, piston and connecting rod assemblies in the same manner.
17. Remove crankshaft bolt and washer, then remove crankshaft pulley and hub or harmonic balancer with Tool J-8215 (fig. 53).
18. Remove oil cooler adapter and discard gasket.
19. Remove engine rear housing and discard gasket.
20. Remove the oil pick-up screen tube bracket and short crankcase bolt.
21. Disconnect flywheel housing from Tool J-8280, then remove crankcase assembly and flywheel housing from engine stand and place on two short lengths of wood (2" x 4") to protect oil pick-up screen and tube assembly.
22. Remove flywheel housing and discard gasket.
23. Loosen eight long crankcase bolts, then place crankcase on a block of wood at an angle of approximately 15° (left half up) to prevent crankshaft from falling out when left crankcase half is removed (fig. 54).
24. Remove eight crankcase bolts and remove left crankcase half.
25. Remove camshaft assembly by turning while lifting.

    CAUTION: Remove camshaft carefully to avoid damage to camshaft surfaces in crankcase.
26. Remove crankshaft assembly by lifting straight out.
27. Remove main bearings from each crankshaft half by rotating bearings with fingers (tang and first) (fig. 55).

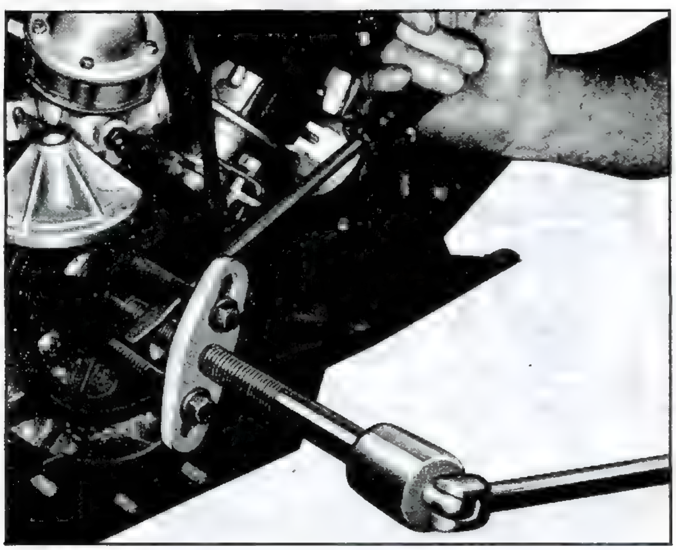


Fig. 53—Removing Harmonic Balancer

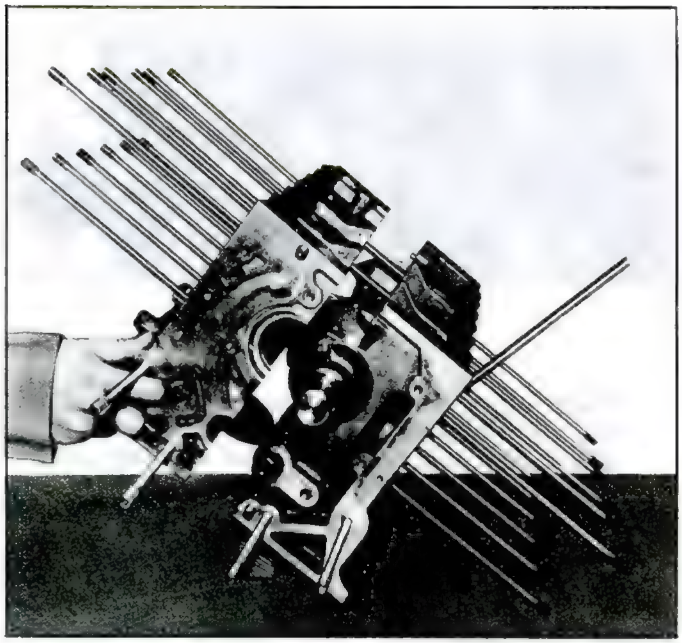


Fig. 54—Removing Left Crankcase Valve

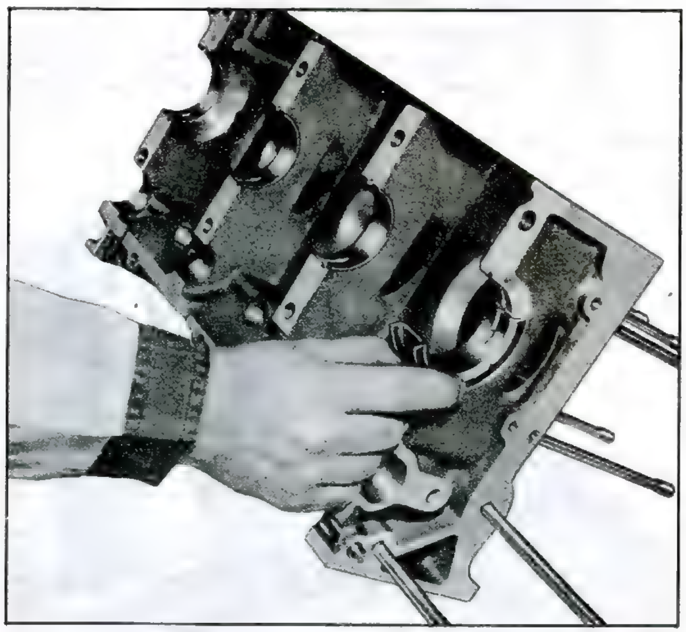


Fig. 55—Removing Main Bearings

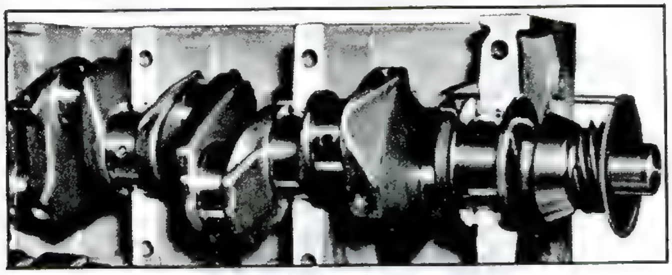


Fig. 56—Crankshaft Installed

NOTE: If main bearings are to be replaced, discard bearings. If bearings are to be reused, place on a rack so they can be reinstalled in their original location.

Cleaning and Inspection

Wash all engine shrouds and shields in cleaning solvent and dry with compressed air. Cleanliness is very important, oil or foreign material on engine shrouding may result in objectionable fumes within the passenger compartment.

NOTE: Cleaning and inspection of all subassemblies is covered under the individual subassembly being serviced.

Assembly

NOTE: All threads inserted in aluminum should be coated with Permatex 404 anti-sieze compound or its equivalent.

1. Install main bearings in crankcase halves and lubricate with a light coat of engine oil.

   NOTE: For selection of correct size main bearings, refer to Repair Procedures, Main Bearings.

2. Place right crankcase half on a block of wood at an angle of approximately 15° (studs down).
3. Install crankshaft assembly in right crankcase half (fig. 56), being careful not to damage bearings.
4. Install camshaft assembly, guiding camshaft thrust washer into groove in crankcase (fig. 57), while indexing valve timing marks on camshaft and crankshaft gears (fig. 58).

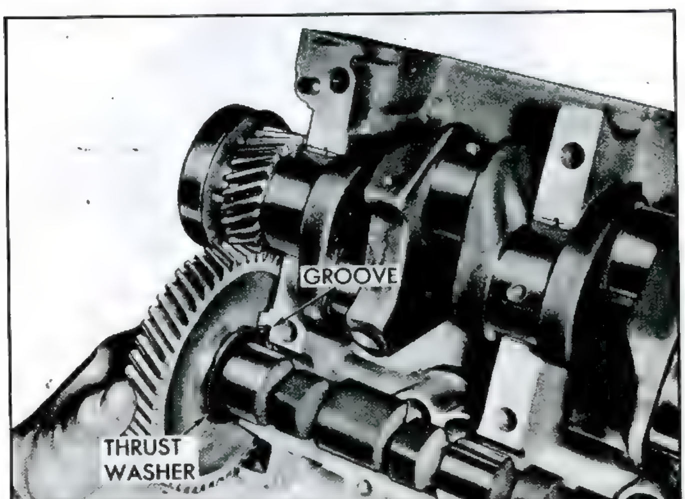


Fig. 57—Installing Camshaft

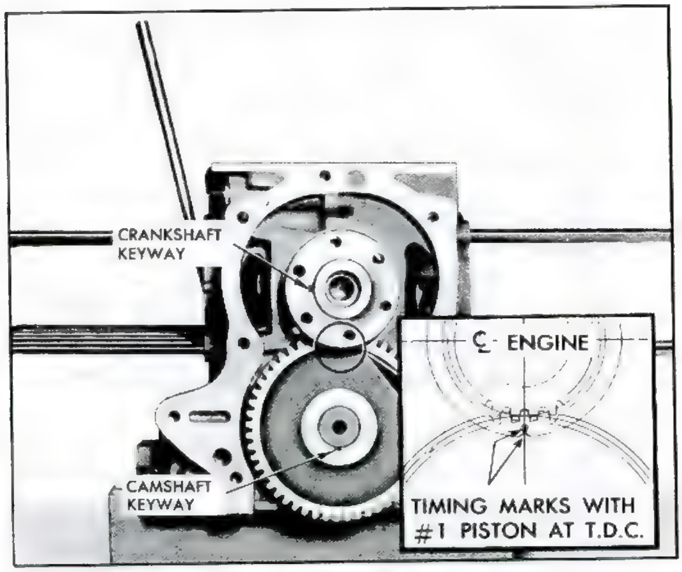


Fig. 58—Timing Marks

   NOTE: If a new camshaft is being installed, coat camshaft lobes with Molykote or its equivalent.

5. Seal crankcase parting line ends with sealer and install left crankcase half to right crankcase half. Install crankcase bolts (8 long) finger tight, then place crankcase on two short lengths of wood (2 x 4) and torque crankcase bolts to specifications in the sequence shown (fig. 59).
6. Measure crankshaft end play with a dial indicator as follows:

   Install dial indicator so indicator point touches end of crankshaft (fig. 60).

   Push crankshaft to rear, then zero dial indicator and push crankshaft to front.

   Read dial indicator. Crankshaft end play should be .002" to .006". If end play is excessive check rear main bearing, crankshaft and crankcase thrust surfaces.

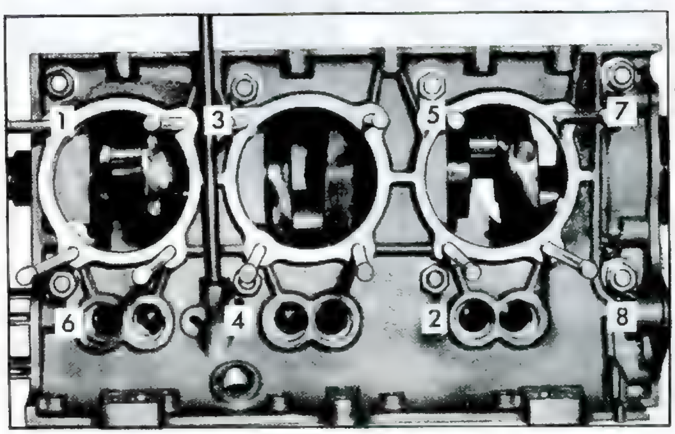


Fig. 59—Crankcase Torque Sequence

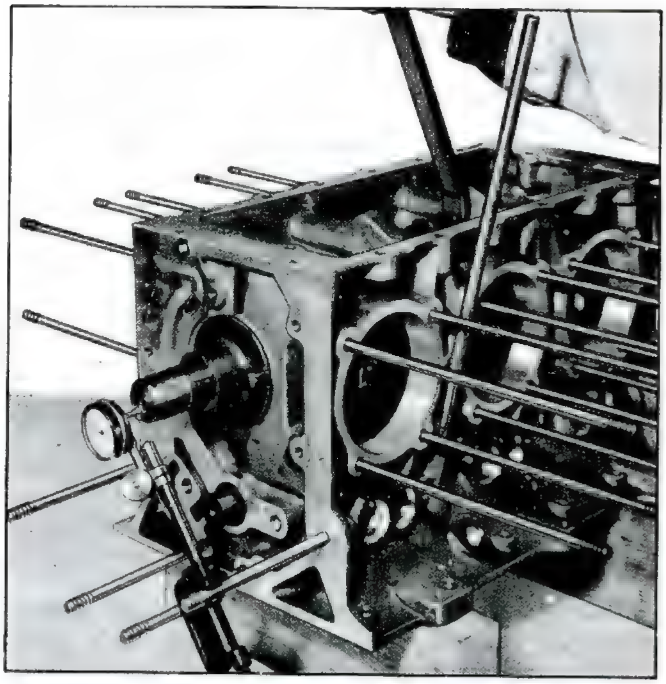


Fig. 60—Measuring Crankshaft End Play

7. Measure camshaft end play with a dial indicator as follows:

   Install dial indicator so indicator point touches end of camshaft (fig. 61).

   Push camshaft to rear, then zero dial indicator and push camshaft to front.

   Read dial indicator. Camshaft end play should be .002" to .007". If end play is excessive, check the thrust washer and/or groove for wear.
8. Measure timing gear backlash with a dial indicator as follows:

   Install dial indicator so indicator point touches camshaft gear tooth (fig. 62).

   Rotate camshaft gear counter-clockwise until backlash is taken up, then zero dial indicator and rotate camshaft gear clockwise (only through backlash).

   Read dial indicator. Camshaft backlash should be .002" to .004". If backlash is excessive, check camshaft gear and crankshaft gear for wear.
9. Using a new gasket, install flywheel housing (with a new seal) and torque to specifications.

   NOTE: Total indicator runout for flywheel housing pilot is .015".
10. Install crankcase and flywheel housing on engine stand (Tool J-5856) by mounting flywheel housing to adapter (Tool J-8280).
11. Using a new gasket, install engine rear housing (with a new seal) and torque to specifications.

    NOTE: Nuts will be installed on studs later.
12. Install crankshaft pulley and hub or harmonic balancer as follows:

    Block crankshaft from rotating with a wooden wedge, then coat engine rear housing seal surface with oil.

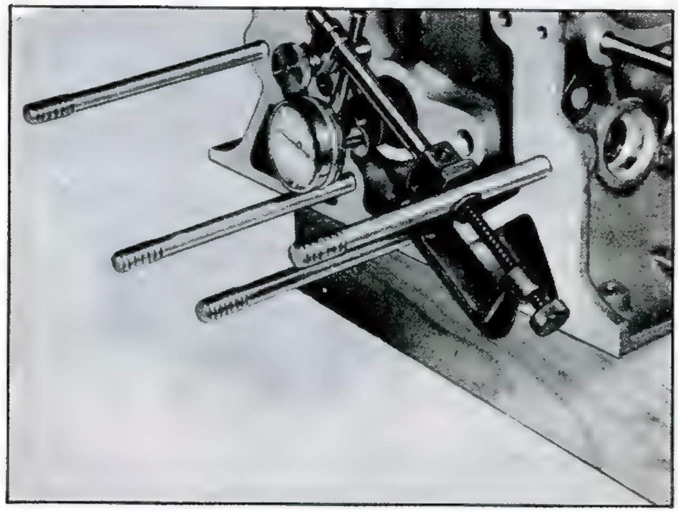


Fig. 61—Measuring Camshaft End Play

    Place crankshaft pulley and hub or harmonic balancer on crankshaft with keyway lined up, then install heavy flat washer and retaining bolt and pull crankshaft pulley or harmonic balancer into place with retaining bolt.

    Back retaining bolt off one turn, then torque to specifications.

    CAUTION: Do not drive crankshaft pulley or harmonic balancer onto crankshaft. To do so may damage crankshaft thrust bearing and crankcase.
13. Using a new gasket, install oil cooler adapter and torque bolts to specifications.
14. Install cylinder, piston and connecting rod assemblies as follows:

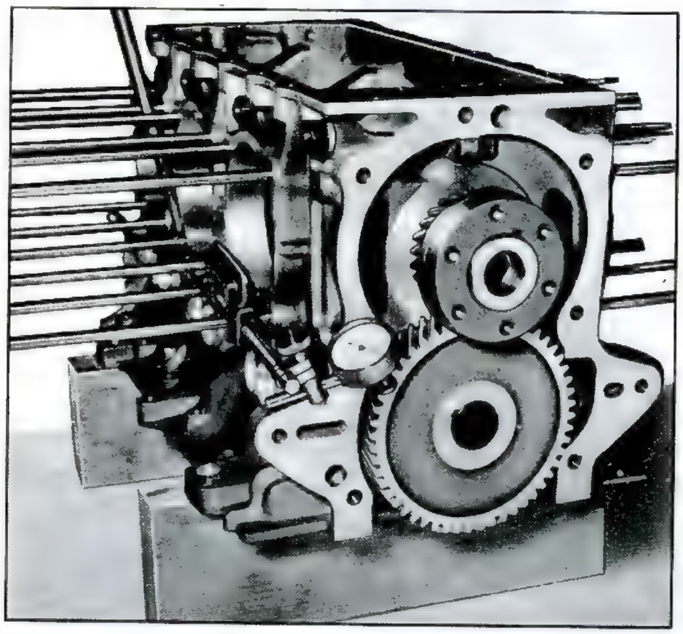


Fig. 62—Measuring Timing Gear Backlash

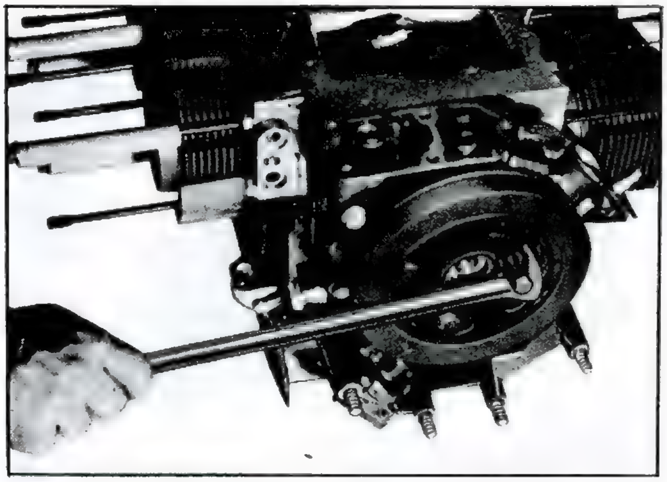


Fig. 63—Turning Crankshaft

Using a 3/4" wrench on crankshaft bolt, turn crankshaft so number 1 connecting rod can be installed.

CAUTION: If torque required to turn crankshaft exceeds specified torque for crankshaft bolt, install two 3/8" x 16 x 1-1/4" bolts in crankshaft pulley and hub or harmonic balancer. (Do not install bolts over 1/4 deep or engine rear housing seal may be damaged.) A bar, used between the bolts (fig. 63), can be used to turn the crankshaft.

Remove connecting rod cap from number 1 connecting rod and, if not previously done, place connecting rod bearing in connecting rod and connecting rod cap.

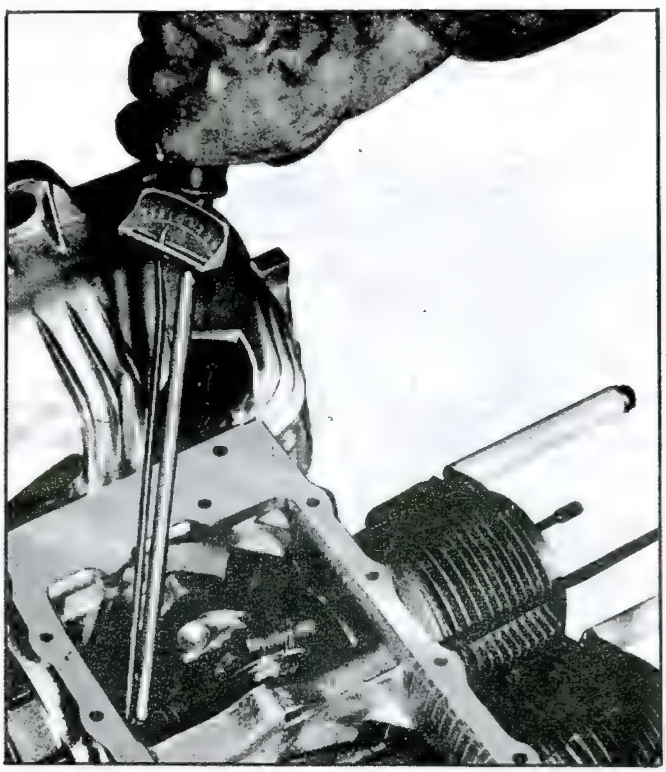


Fig. 64—Torquing Connecting Rod Nut

NOTE: For selection of correct size bearings; Refer to Repair Procedures, Connecting Rod Bearings.

Coat bearing with oil then place a piece of 5/16" I.D. plastic or rubber hose over connecting rod bolts. This will protect bearing surface on crankshaft journal while piston is being installed.

Install a new cylinder gasket over cylinder, then push piston with a hammer handle, while guiding cylinder into crankcase and connecting rod onto crankshaft journal.

Remove protective hose from connecting rod bolts, install connecting rod cap and torque connecting rod nuts to specifications (fig. 64).

Install cylinder holding fixture over one short and one long stud. (Holding fixture outlined under Engine Disassembly.)

Install the remaining cylinder, piston and connecting rod assemblies in the same manner.

15. When all cylinder, piston and connecting rod assemblies have been installed, check side clearance (fig. 65).
16. Install cylinder air baffles and retaining springs.
17. Install a new crankcase cover gasket, then crankcase vent and another new crankcase cover gasket. (fig. 66) Install crankcase cover and torque to specifications.
18. Using a new "O" ring seal, install crankcase vent tube then bracket and torque to specifications (fig. 67).
19. Invert the engine and install oil pickup tube bracket and short crankcase bolt (fig. 68) and torque bolts to specifications, then using a new gasket, install the oil pan and torque to specifications.
20. Install cylinder head assemblies as follows:

    Remove holding fixture from cylinders on left bank.

    Place cylinder head gaskets in left cylinder head combustion chamber (fig. 69).

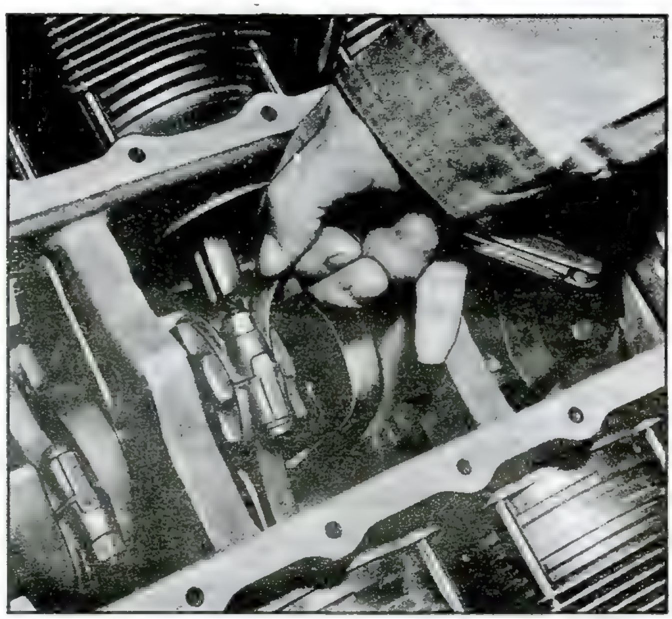


Fig. 65—Connecting Rod Side Clearance

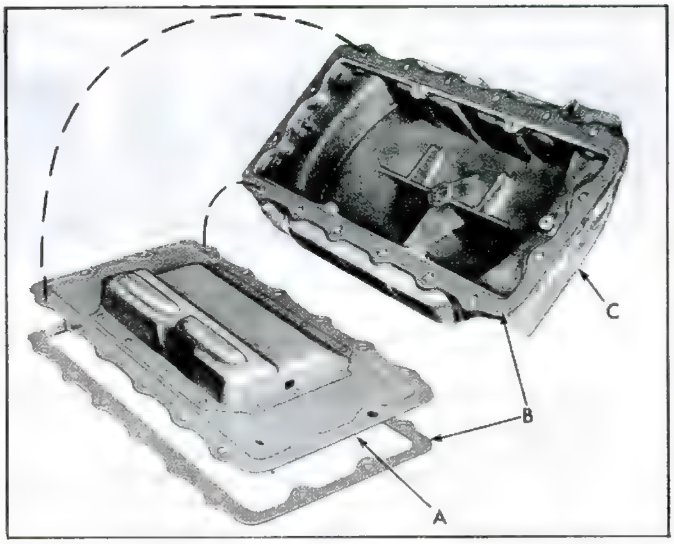


Fig. 66—Crankcase Cover and Vent

a. Crankcase Vent b. Gaskets c. Crankcase Cover

Install cylinder head over studs and carefully guide into place.

Install 6 cylinder head nuts (finger tight).

Lightly oil valve lifters and install in their proper bores.

NOTE: Whenever new valve lifters are installed, coat foot of lifter with Molykote or its equivalent.

Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes; then install push rod tubes through bore in cylinder head and install new "O" ring seals, lightly coated with oil, on inner end of push rod tubes (fig.70).

Start push rod tubes into bores in cylinder head and crankcase, then seat the tubes with a 9/16" deep socket (placed against the cylinder head end of the push rod tube and tapped lightly with a hammer) (fig. 71).

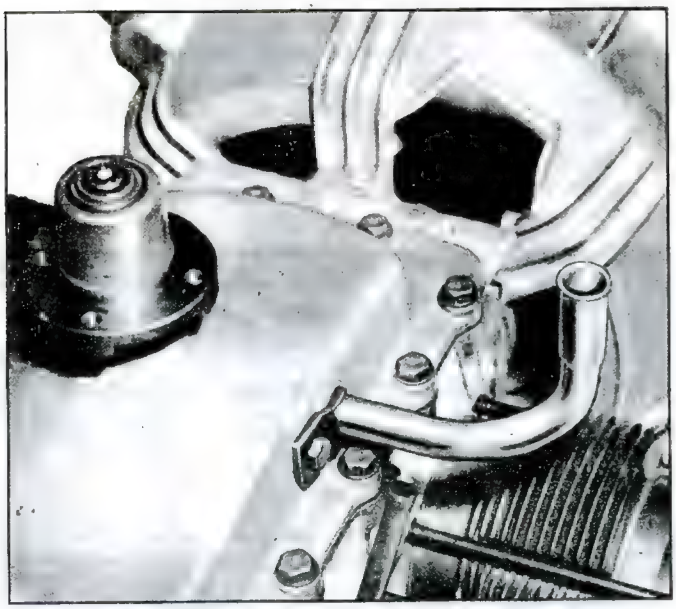


Fig. 67—Crankcase Vent Tube

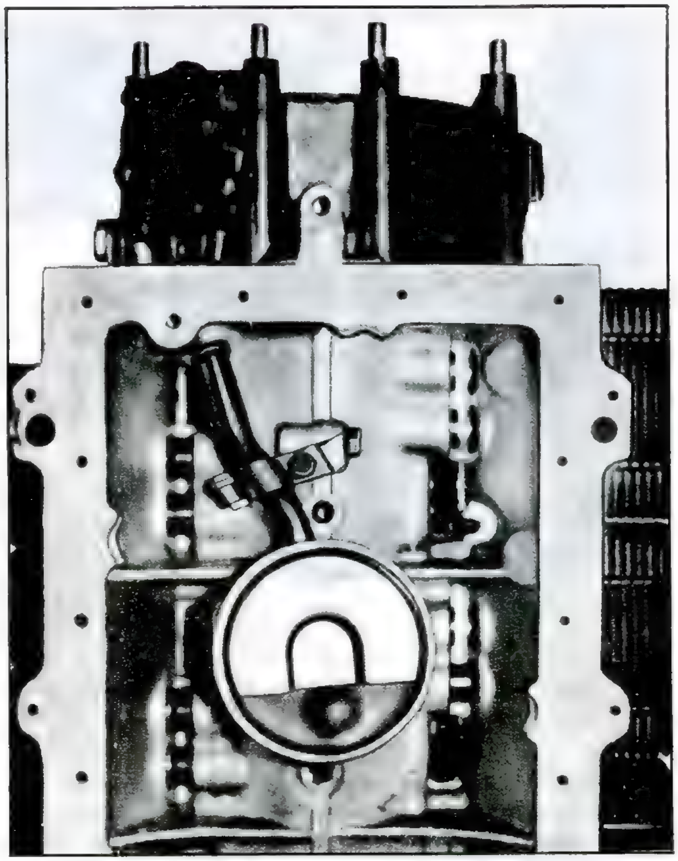


Fig. 68—Oil Pick-Up Screen Installed

Install new "O" ring seals, lightly coated with oil into rocker arm stud bore in cylinder head.

Install push rod guides (fig. 72), then valve rocker arm studs (finger tight).

Torque cylinder head nuts and valve rocker arm studs, a little at a time, in the sequence shown (fig.73) until the specified torque is reached.

Install push rods with the side oil hole out (fig. 74).

Install valve rocker arms, rocker arm balls and rocker arms nuts. Tighten rocker arm nuts until push rod end play is taken up.

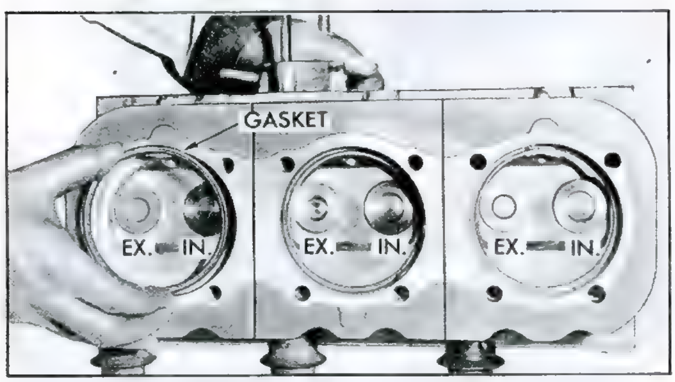


Fig. 69—Cylinder Head Gasket Installation

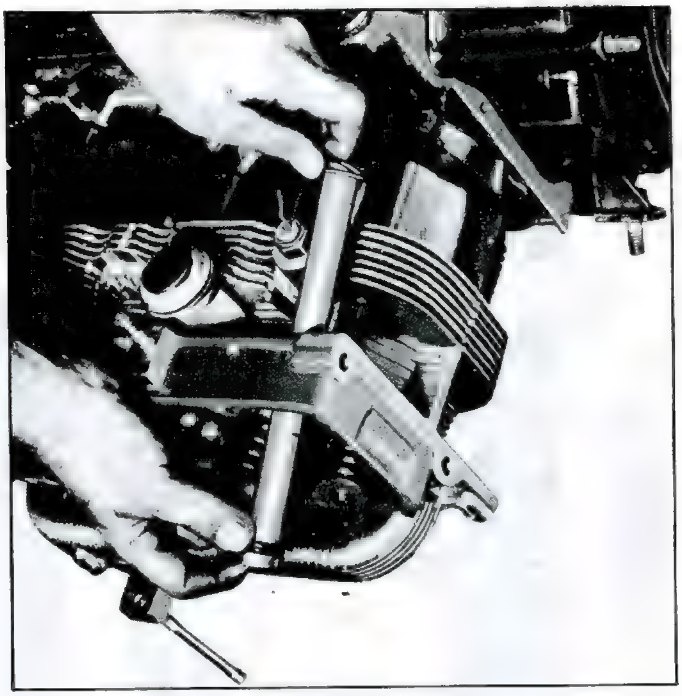


Fig. 70—Installing Push Rod Tubes

NOTE: Whenever new valve rocker arms or rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent.

Install the right cylinder head in the same manner.

21. Install muffler hanger and rear shrouds, then using new seals install oil cooler and torque to specifications.
22. Connect wire to cylinder head temperature sending unit and install front shrouds.
23. Install exhaust manifolds as follows:

    Install new exhaust packings (steel flange on packing out) on exhaust port sleeves.

    CAUTION: Exhaust port sleeves are a press fit in the cylinder head and exhaust manifold. The exhaust manifold must fit correctly to prevent leaks.

    Install exhaust manifolds, exhaust manifold clamps, french locks and nuts. Using a plastic hammer, tap

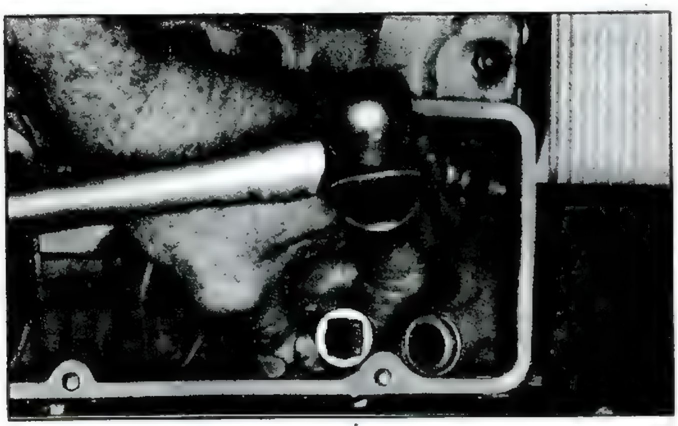


Fig. 71—Seating Push Rod Tubes

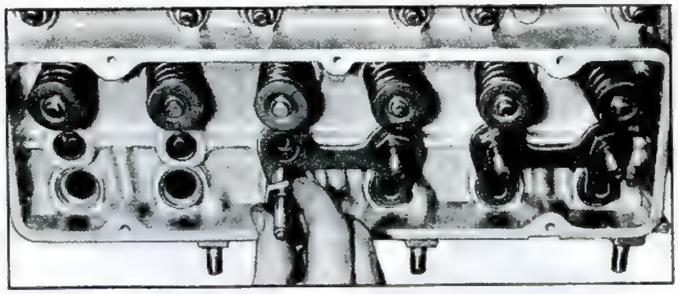


Fig. 72—Installing Push Rod Guides

manifold into place while tightening nuts a little at a time (fig. 75).

Bend french locks over manifold nuts.

24. Install engine skid plate and rear mounting bracket (with lifting adapter attached). Torque nuts to specifications.
25. Install exhaust ducts, lower shrouds, and tighten all bolts securely.

    NOTE: Check exhaust damper door adjustment as outlined and adjust if necessary.
26. Turn engine right side up and install distributor as follows:

    Rotate crankshaft counterclockwise until number 1 cylinder is at T.D.C. (timing mark at 0 on tab) of COMPRESSION stroke (fig. 76).

    Set distributor with rotor pointing to number one cylinder position and note position of drive tang on distributor shaft.

    Using a long screw driver, turn oil pump shaft (through distributor bore in engine rear housing) until slot in oil pump will match distributor tang.

    Using a new gasket, install distributor and rotate until points are just opening (rotor pointing to number 1 position).

    Install retaining clamp and nut and tighten securely.
27. Adjust valves as follows:

    With number 1 cylinder on T.D.C. of compression stroke (set in previous step), adjust the valves on No. 1 intake, No. 1 exhaust, No. 3 intake and No. 5 exhaust on the right bank and No. 4 exhaust and No. 6 intake on the left bank.

    NOTE: Turn adjusting nut out until there is end play in the push rod, then turn adjusting

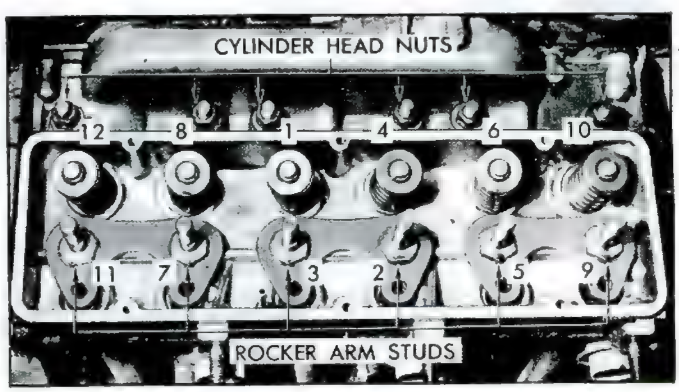


Fig. 73—Cylinder Head Torque Sequence

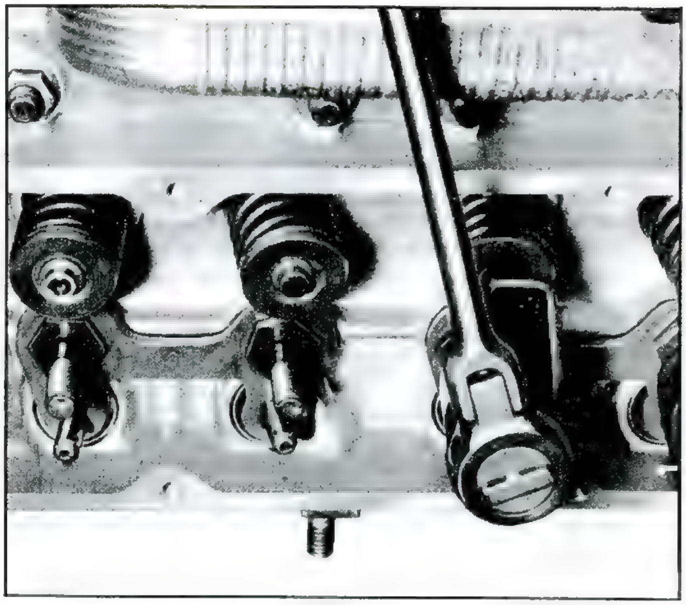


Fig. 74—Push Rods Installed

nut in until there is no end play at push rod (may be felt by twisting push rod) (fig. 77). Turn adjusting nut one additional turn in (to center plunger in hydraulic valve lifter).

Turn crankshaft one turn counter-clockwise (number 2 cylinder at T.D.C. of COMPRESSION stroke and timing mark at 0 on the tab) and adjust the valves on No. 3 exhaust and No. 5 intake on the right bank and No. 2 intake, No. 2 exhaust, No. 4 intake and No. 6 exhaust on the left bank

28. Using new gaskets, install valve rocker covers and spring reinforcements then torque to specifications (fig. 78).
29. Install muffler shield and tighten securely.
30. Install spark plugs (clean if necessary) with new gaskets and torque to specifications.
31. Install blower then blower pulley and torque to specifications.
32. Install left and right shields then top shroud and tighten securely.

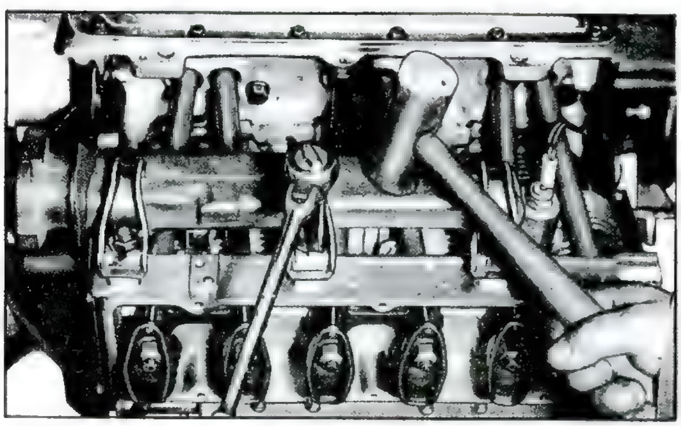


Fig. 75—Installing Exhaust Manifold

Fig. 76—Locating T.D.C. on Number Cylinder

NOTE: Rotate blower and check for sufficient clearance, while tightening top shroud.

33. Install coil and tighten securely then connect wire from distributor.
34. Attach a chain and shackle (from Tool J-4536-A) to lifting adapter and lifting eye at flywheel housing.
35. Using a chain fall or comparable lift, remove engine from engine stand and flywheel housing adapter, then install engine on lifting jack and adapter (Tool J-8280).
36. Remove chain and shackle and remove lifting adapter from rear mounting bracket.

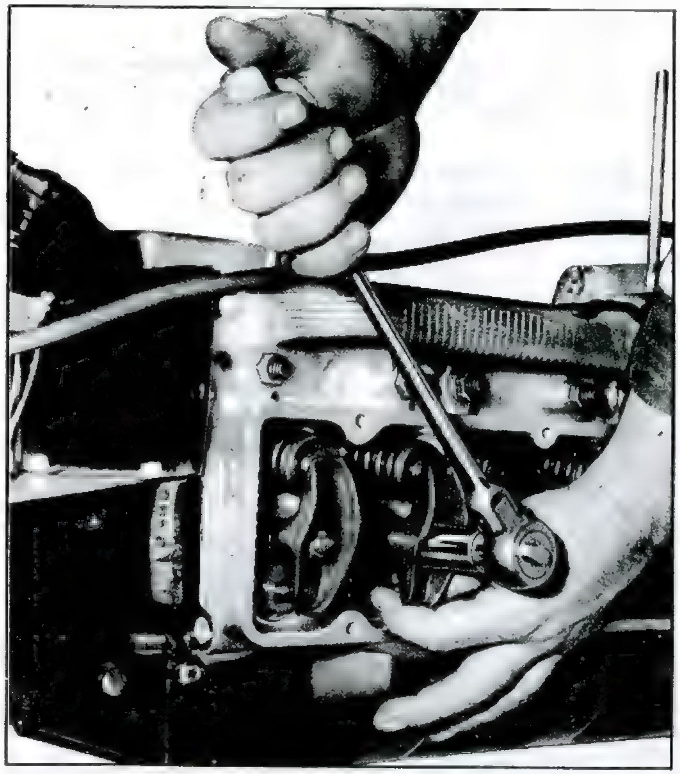


Fig. 77—Adjusting Valves

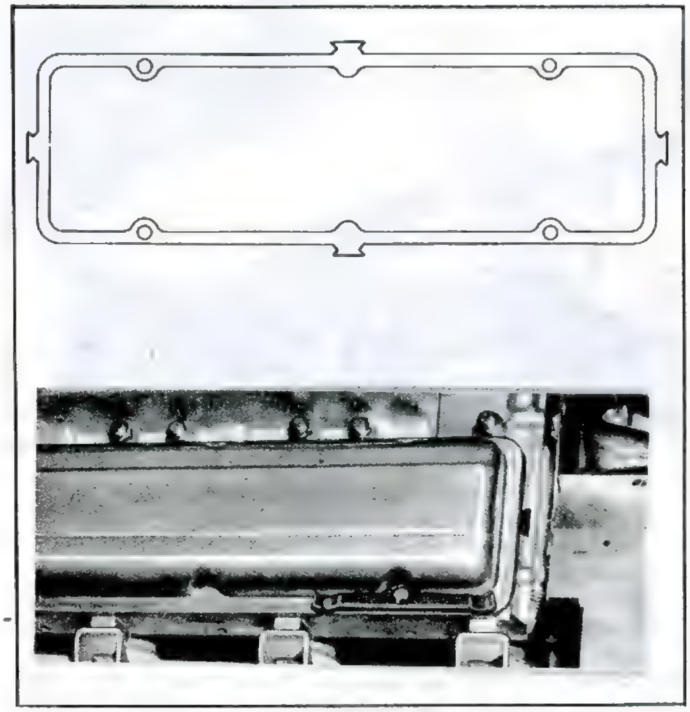


Fig. 78—Valve Cover and Gasket

37. Install flywheel (Synchromesh) or flex plate (Automatic) as follows:

Apply sealer to end of crankshaft and install flywheel or flex plate as indexed during disassembly. Install spacer (on Synchromesh), then install bolts with sealer on bolt threads, and torque to specifications.

NOTE: Total indicator runout for flywheel face is .020". Total indicator runout for flywheel O.D. is .010".

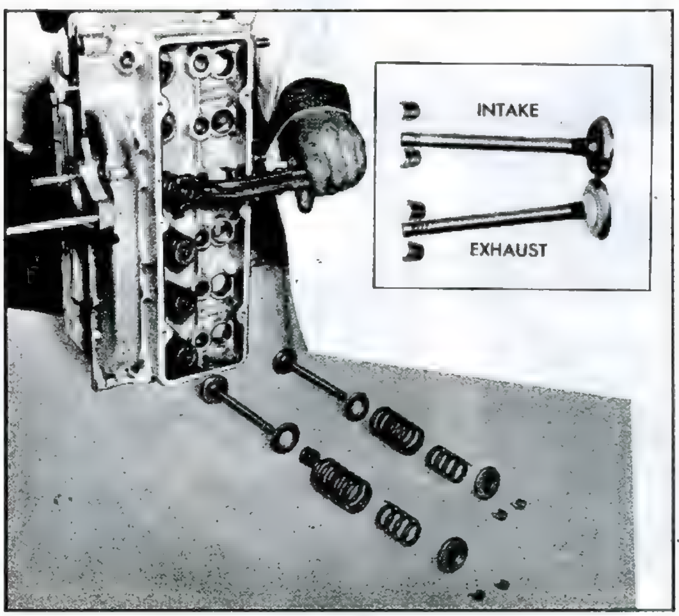


Fig. 79—Compressing Valve Springs

38. Using a new gasket, install oil filter and Delcotron adapter and torque to specifications.
39. Install a new oil filter (with a new gasket) and torque to specifications then connect wire to oil pressure gauge sending unit.
40. Install front shield and tighten securely.
41. Install fuel pump push rod and spring assembly, then using a new "O" ring seal install fuel pump and fuel lines as an assembly. Locate hole in fuel pump with set screw then torque set screw and locknut to specifications.
42. Complete engine assembly as follows:

Install grommet (with starter wiring in front shield).

Install and connect distributor cap and spark plug wire assembly.

Install oil cooler access hole cover.

Install Delcotron and Delcotron bracket and tighten securely. Tighten bolts to adapter before tightening bracket.

Install vacuum balance tube and crankcase ventilation tube and hoses.

Install carburetors and cross shaft as an assembly.

Install and connect vacuum advance hose at right carburetor and distributor.

Install upper choke control rods and adjust and connect as outlined in Section 6M.

Install and connect fuel lines.

Install and adjust blower belt as outlined.

Install oil level gauge.

Install air cleaner assembly.

Fill with engine oil.

CYLINDER HEAD ASSEMBLIES

CAUTION: Use extreme care in handling cylinder heads to avoid damaging cooling fins.

Disassembly

1. Place cylinder head assembly on end and using Tool J-8062, with off-set jaws, compress valve spring, then remove valve locks (fig. 79).

   NOTE: It may be necessary to tap valve spring caps lightly with a hammer to loosen valve locks in valve caps.

2. Release Tool J-8062 and remove valve spring cap, valve spring (and damper is used), valve, and valve spring shims.
3. Remove remaining valves and valve components in the same manner.
4. Remove valve stem oil seals from intake valve guides.

   NOTE: Under normal circumstances, no further disassembly of the cylinder head is necessary. If a cylinder head is to be replaced, it will be necessary to transfer or install carburetor studs, exhaust manifold studs, choke coil and control rod assembly, vacuum balance tube, carburetor mounting pad plug and cylinder head temperature unit as outlined under Repairs.

Cleaning

1. Clean carbon from combustion chambers and ports using Tool J-8358 (fig. 80).

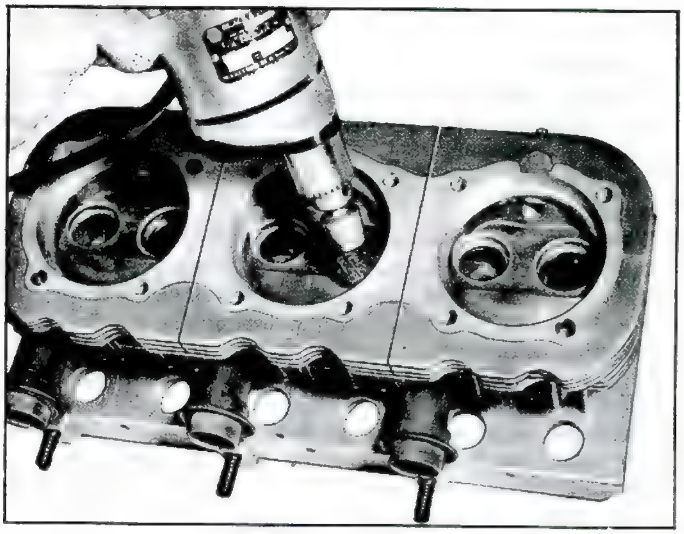


Fig. 80—Removing Carbon from Combustion Chamber

CAUTION: Avoid injury to cylinder sealing face surface in cylinder head. Injury will cause premature combustion chamber leaks.

2. Thoroughly clean valve guide bores, using Tool J-8101 (fig. 81).
3. Clean valve stems and valve heads on a buffing wheel.
4. Wash all parts in cleaning solvent and dry them thoroughly.

Inspection

1. Inspect cylinder heads for damage. Check fit of exhaust manifold sleeve assembly; if loose or cracked, replace as outlined under Repairs.

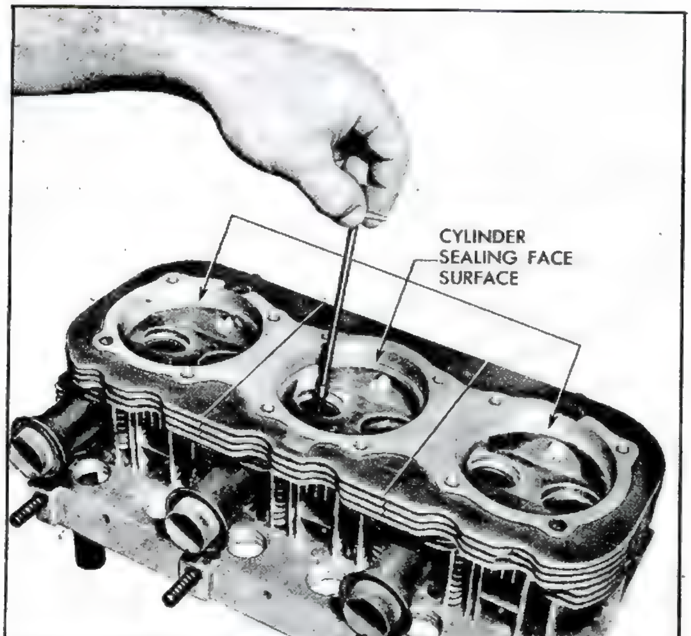


Fig. 81—Cleaning Valve Guides

2. Inspect the valves for burned faces, excessive seat pound in, cracked faces or badly scuffed or worn valve stems.
3. Inspect valve seats for cracks or burnt seats. Inspect valve guides for cracks or excessive wear.

   NOTE: If valve seats are beyond repair, cylinder head replacement is necessary. Excessive valve to bore clearance may cause oil consumption. Insufficient clearance will result in noisy and sticky functioning of the valve and disturb engine smoothness of operation.

4. Measure valve stem clearance (fig. 82) as follows: Clamp a dial indicator on one side of the cylinder head rocker cover gasket rail, locating the indicator so that movement of the valve stem from side to side (crosswise to the head) will cause a direct movement of the indicator stem. The indicator stem must contact the side of the valve stem just above the valve guide. With the valve head dropped about 1/16" off the valve seat; move the stem of the valve from side to side, using light pressure to obtain a clearance reading. If clearance exceeds specifications it will be necessary to ream valve guides for oversize valve or replace valve guides as outlined under Repair.

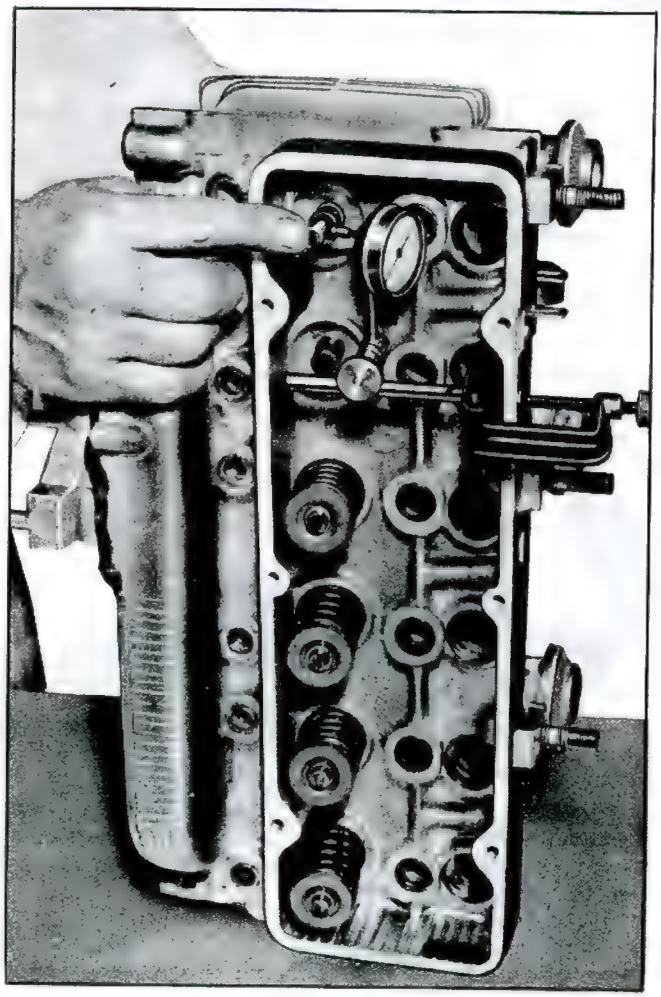


Fig. 82—Measuring Valve Stem Clearance

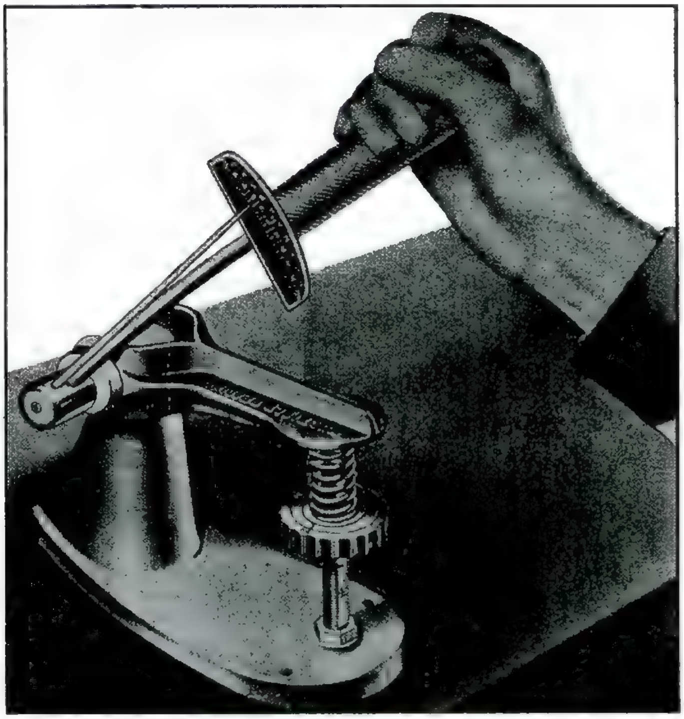


Fig. 83—Checking Valve Spring Tension

5. Check valve spring tension with Tool J-8056 (fig. 83).

   NOTE: Weak springs affect power and economy and should be replaced if not within 5 lbs. of specifications.

6. Inspect the cylinder head for restrictions in the air circulating passages formed by the cooling fins.

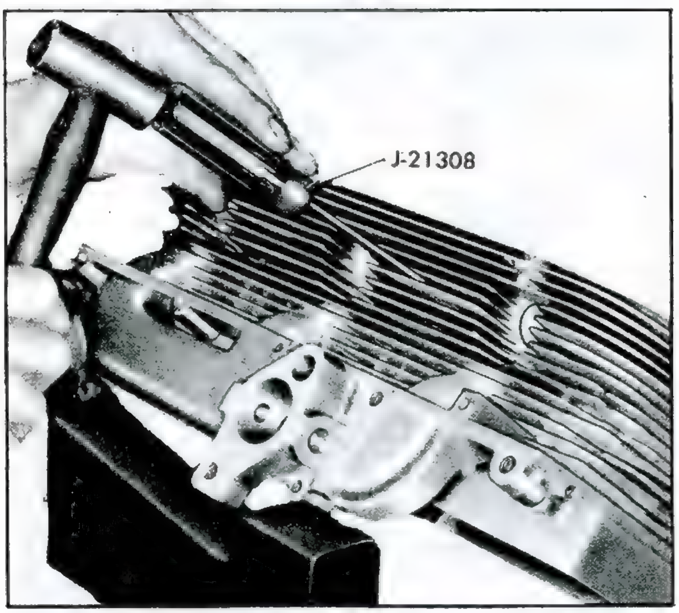


Fig. 84—Cleaning Cooling Fins

Repairs

Cooling Fins

Casting flash or a build-up of other foreign material that could decrease cooling efficiency can be removed from the air passages using the J-21308 Fin Cleaning Tool (fig. 84).

Valve Seats

Reconditioning the valve seats is very important, because the seating of the valves must be perfect for the engine to deliver the power and performance built into it.

Several different types of equipment are available for reseating valve seats; the recommendations of the manufacturer of the equipment being used should be carefully followed to attain proper results.

Regardless of what type of equipment is used, however, it is essential that valve guides be free from carbon or dirt and not worn excessively to insure proper centering of the pilot in the guide.

> **NOTE:** Cylinder Heads have hardened exhaust and inlet valve seat inserts.

Regardless of the methods used for valve seat repair, the final seat width in cylinder head should be as stated in specifications.

Valve seat angle on all seats should be 45° and should be concentric within .002" indicator reading. Always dress stones to proper angle before grinding valve seat (fig. 85).

Valves

Valve faces that are pitted can be refaced to the proper angle, insuring correct relation between the head and stem, on a valve refacing machine. Valve stems which show excessive wear, or valve faces that are pounded in or warped excessively should be replaced. When a valve face which is pounded in or warped excessively is refaced, a knife edge will be ground on part or all of the valve head due to the amount of metal that must be removed to completely reface. Knife edges lead to premature breakage, burning and pre-ignition due to heat localizing on this knife edge. If the edge of the valve head is less than 1/32" thick after grinding, replace the valve.

1. If necessary, dress the valve refacing machine grinding wheel to make sure it is true and smooth.
2. Set chuck angle at 44° mark for grinding valves.
3. After setting chuck angle, insert valve and grind carefully.

Exhaust Manifold Sleeves

> **NOTE:** Do not remove exhaust manifold sleeves unless absolutely necessary. If exhaust sleeves are removed, they should be replaced with the next largest diameter sleeve.

1. Warm cylinder head to 200° F. then remove exhaust manifold sleeves with a suitable pipe wrench by turning gradually (fig. 86).

   NOTE: Do not tap or pry sleeves from cylinder head.

2. Check exhaust manifold sleeve installation holes in cylinder head for nicks or damage.
3. Coat new sleeves with anti-seize compound and locate flat side, parallel to exhaust push rod tube hole.

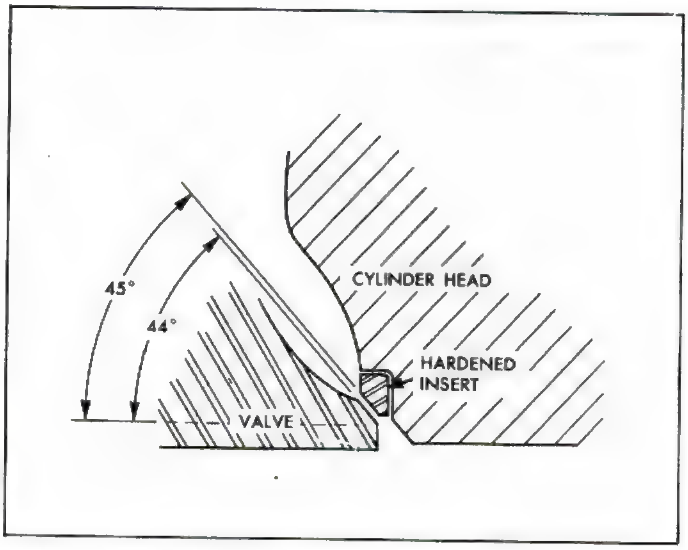


Fig. 85—Relation of Valve and Seat Angles

NOTE: Be careful when replacing sleeves. They are installed in the cylinder head with a press fit and must be started into place, true with the exhaust bore in the cylinder head.

NOTE: Sleeves are available in standard, .002" and .010" oversize for service.

4. Place sleeves in a container of dry ice (solidified carbon dioxide) for about 10 minutes.
5. Warm cylinder head to about 200° F. support cylinder head to avoid damage to cooling fins.

   CAUTION: Do not use an open flame.

6. Remove sleeves, one at a time from dry ice and tap into place with a soft tool.

   NOTE: Do not damage exhaust manifold end of sleeves, they are a press fit into the exhaust manifold.

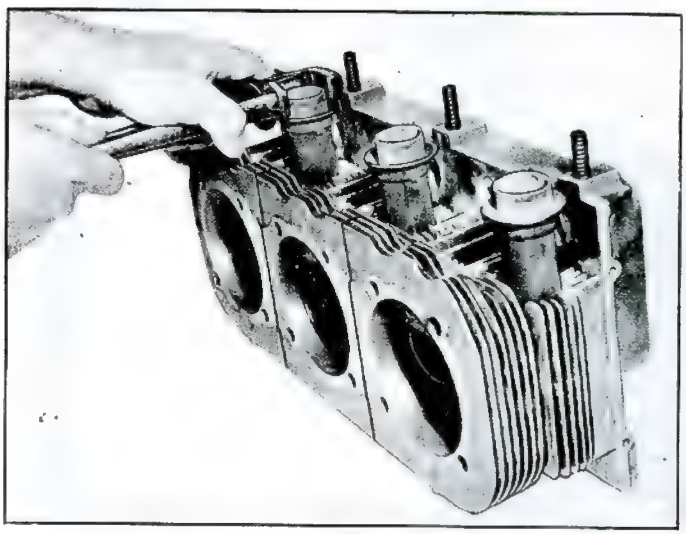


Fig. 86—Removing Exhaust Manifold Sleeves

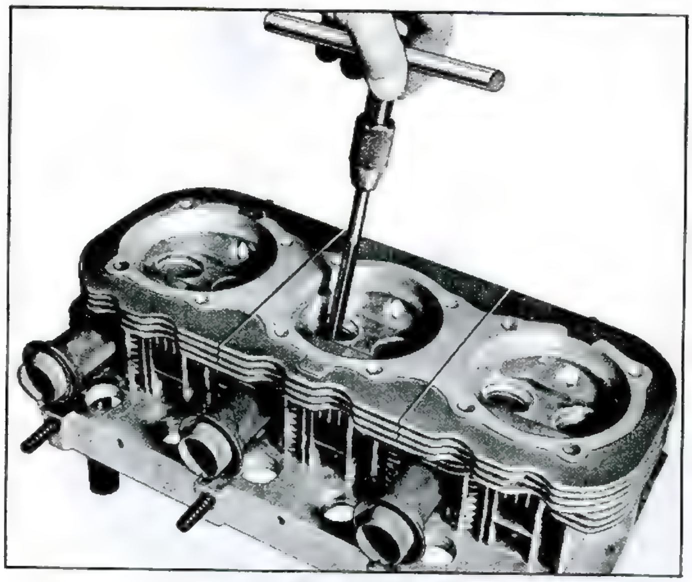


Fig. 87—Reaming Valve Guide

Valve Guides (Reaming)

Oversize valves can be utilized to obtain proper valve to guide clearance in all cases except when the guide is either cracked or is worn to the extent that reaming will not clean-up the guide bore to permit use of the largest oversize valve available.

Valves are available with: standard diameter, .003", .010" and .020" oversize stems.

1. Select from the reamers listed below, the smallest diameter oversize reamer that will provide proper refinish of the guide bore.

   Reamer J-5830-1 use for .003" oversize valve.
   Remaer J-5830-4 use for .010" oversize valve.
   Reamer J-5830-5 use for .020" oversize valve.

   NOTE: Reamers listed above are included in Hand Reamer Set J-5830.

2. Ream bore of valve guide, starting at the combustion chamber side (fig. 87) and flush with cutting oil to avoid scoring. Do not force or withdraw reamer during reaming operation. Reamer should pass completely through bore and be removed at the valve spring side of the cylinder head. Wipe refinished bore to remove cutting oil and chips; inspect bore.
3. Inspect valve seat and reface as necessary to obtain correct seat angle and concentricity with guide bore.
4. Select and use valve in same nominal oversize as that of reamer last used in refinishing the guide bore.

Valve Guides (Replacement)

Replacement valve guides for all Corvair engines, except the turbocharged engine, are available in O.D. oversizes of .002" (replacement standard), .010" and .020". The service guides are bored to permit use of valves with standard diameter stems.

1. Remove worn guides using the J-21280 Remover and a hammer (2 lb. minimum). Drive valve guide from the spring seat side (fig. 88) so that the guide will exit on the combustion chamber side of the cylinder head.

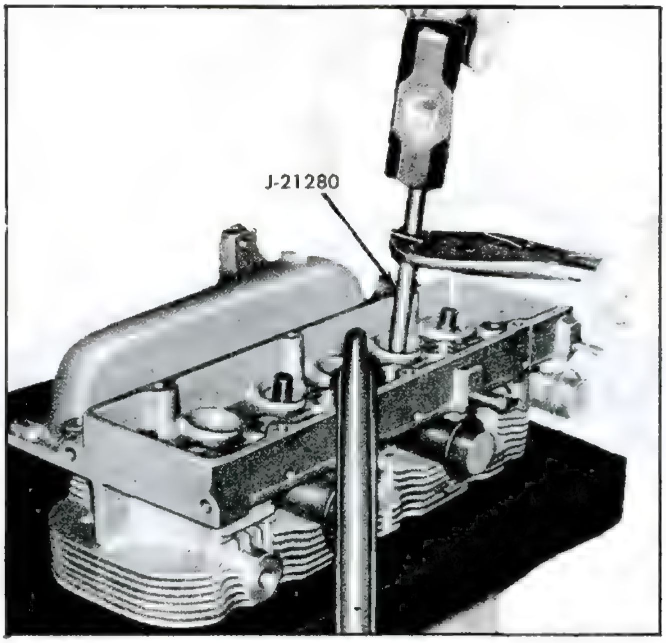


Fig. 88—Removing Valve Guide

2. Wipe out valve guide bore in cylinder head and closely inspect for scoring or damage during guide removal. Use the following method to select the replacement valve guide required for each location.
3. If guide bore in cylinder head appears smooth and free from scoring, select standard size replacement guide.
4. If some damage in bore is evident, ream bore with .010" oversize (J-21282) Hand Reamer starting at the combustion chamber side and flushing with cutting oil to avoid scoring (fig. 89). Do not force or remove reamer during reaming operation. Pass reamer completely through bore and remove from valve spring side. Wipe refinished bore to remove cutting oil and chips; inspect bore. Finish bore diameter should now be .524" - .525". If bore is smooth and free of scoring after reaming, select .010" O.D. oversize valve guide.
5. If reaming with the .010" reamer did not clean the guide bore in the cylinder head, use the .020" oversize (J-21283) Hand Reamer and select .020" O.D. oversize valve guide. Wipe valve guide bore to temove cutting oil and chips. Finished bore diameter should now be .534" - .535".
6. Coat outside diameter of the selected valve guide with oil; then using Guide Installer J-21281 and a hammer, start guide, tapered end first, into bore from combustion chamber side of the cylinder head. Final installed height should be approximately 1" from the top surface of the valve seat insert to the end of the guide. Correct height can be determined by aligning the groove on the installer--flush with top surface of the valve seat insert (fig. 90).
7. Liberally oil valve stem bore and ream through from the combustion chamber side, using Hand Reamer J-21318.
8. Recondition valve seat as necessary to obtain correct seat angle, width, and concentricity with guide bore.
9. Select and use valves with standard diameter stem at locations where new guides were installed.

Studs Replacement

NOTE: To install carburetor attaching studs if replacement is necessary, coat threads with Permatex anti-seize compound #404 or its equivalent.

1. Install long stud 5/16"-18-24 x 4-13/16", using Tool J-8534-2, in intake manifold flange (fig. 91) on left and right bank cylinder heads to a length of 4-3/16".

Fig. 89—Reaming Valve Guide Bore

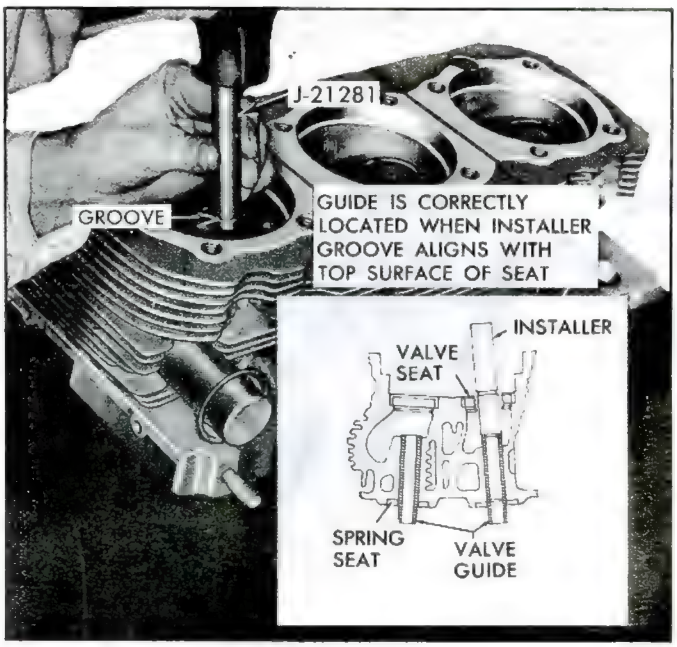


Fig. 90—Installing Valve Guide

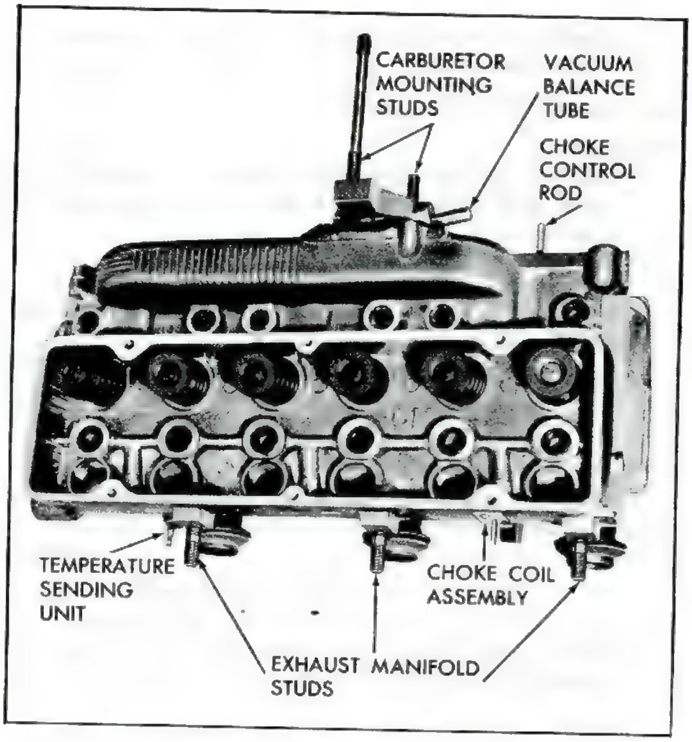


Fig. 91—Cylinder Head Assembly

2. Install short stud 5/16"-18 x 24 x 2-1/4", using Tool J-8354-2 in intake manifold flange 91) on left and right bank cylinder heads to a length of 1-5/8".
3. Install exhaust manifold studs (fig. 91) using Tool J-8354-3 into cylinder head to a length of 31/32".

Thread Repair

Inserts are commercially available for thread repairs at local jobbers and should be installed to prescribed methods furnished by the manufacturer.

Vacuum Balance Tube and Plug Replacement

NOTE: Cylinder Heads are identical except for location of vacuum balance tube hose connector (fig. 91) which is on one side of carburetor mounting pad on the right bank and the other side of the left bank. Install tube in hole to front of cylinder head and plug in hole to rear of cylinder head (as positioned on vehicle).

1. Using a hardwood block and hammer tap tube in place (to shoulder).
2. Use a suitable size drift pin and hammer and tap plug in place (flush with edge of carburetor mounting pad).

Choke Coil and Control Rod Replacement

1. Using a sharp chisel and hammer, with light blows (fig. 92) (hard blows will snap head off twist rivit), tap head of twist rivit in a counter-clockwise direction until rivit starts out.
2. Grip head of twist rivit with vise-grip pliers and remove by turning counter-clockwise.
3. Remove choke coil and control rod assembly from cylinder head.
4. Position choke coil and control rod assembly in cylinder head and tap twist rivit in place with a hammer.

Assembly

NOTE: The valve spring seats on Corvair cylinder heads are recessed, presenting a problem to measure installed height. This measurement can be easily performed before the spring is installed.

1. Measure valve spring installed height as follows:
   After the valve face and seat have been refinished, install the valve in its bore, then install the spring cap and valve locks without the spring.
   Hold the spring cap and pull the valve against its seat in the head.

   NOTE: This locates the spring cap in its installed position.

   While holding the valve as above, measure distance between spring cap and spring seat (fig. 93).

   NOTE: A cutaway scale will help.

   Remove the spring cap and valve locks then install necessary shims. Each valve spring must have a hardened shim (minimum .020") under spring to protect aluminum surface.

   NOTE: Spring Shims are available in .030" thickness. Do not shim if shim will bring installed height below minimum specification.
2. Install each valve with the valve stem coated with Molykote or its equivalent in the valve guide from which it was removed or to valve guide it was fitted.

Fig. 92—Choke Coil Removal

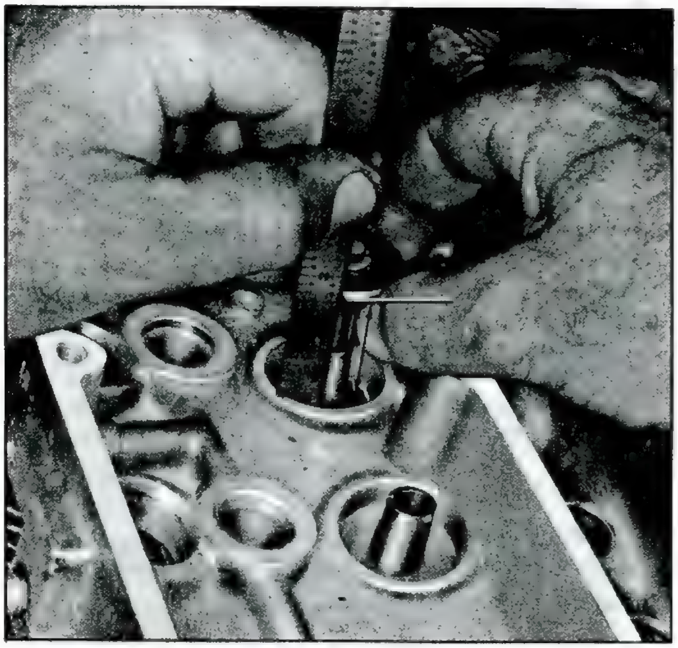


Fig. 93—Measuring Valve Spring Installed Height

3. On intake valves, install new valve stem oil seal using special plastic protector sleeve to prevent damage as seal passes over valve lock grooves. Push seal on guide until it bottoms on guide end.
4. Set valve spring (and damper if used) in place on shim in cylinder head. Place cap in position and compress valve spring with Tool J-8062.
5. Install valve locks and release spring compressor tool, making sure locks seat properly in valve groove on stem.

NOTE: Grease may be used to hold valve locks in place.

Fig. 94—Removing Ball Check Valve

6. Assemble the remaining valves and valve components in the same manner.

VALVE LIFTERS (Hydraulic)

Disassembly

1. Hold the plunger down with a push rod, and using the blade of a small screw driver, remove the push rod seat retainer.
2. Remove the push rod seat and inertia valve assembly.
3. Remove the plunger, ball check valve assembly and the plunger spring.
4. Remove the ball check valve and spring by prying the ball retainer loose from the plunger with the blade of a small screw driver (fig. 94).

Cleaning and Inspection

Thoroughly clean all parts in cleaning solvent, and inspect them carefully. If any parts are damaged or worn the entire lifter assembly should be replaced.

NOTE: Inertia valve and retainer should not be removed from the push rod seat. To check the valve, shake the push rod seat and inertia valve assembly and the valve should move.

Assembly

1. Place the check ball on small hole in bottom of the plunger.
2. Insert check ball spring on seat in ball retainer and place retainer over ball so spring rests on the ball. Carefully press the retainer into position in plunger with the blade of a small screw driver (fig. 95).

Fig. 95—Installing Ball Check Valve

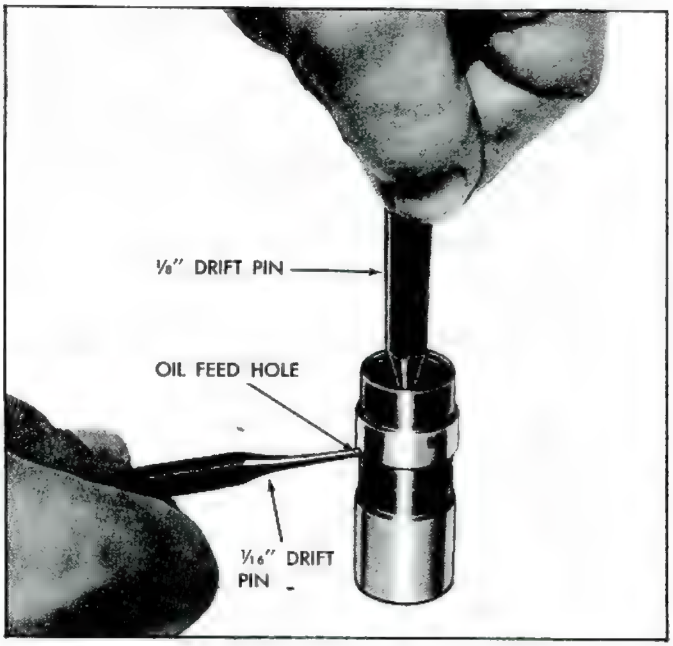


Fig. 96—Assembling the Hydraulic Lifter

3. Place the plunger spring over the ball retainer and slide the lifter body over the spring and plunger, being careful to line up the oil feed holes in the lifter body and plunger.
4. Fill the assembly with SAE 10 oil, then insert the end of a 1/8" drift pin into the plunger and press down solid. At this point oil holes in the lifter body and plunger assembly will be aligned (fig. 96).

   CAUTION: Do not attempt to force or pump the plunger.

5. Insert a 1/16" drift pin through both oil holes to hold the plunger down against the lifter spring tension (fig. 96).

   NOTE: The drift pin must not extend inside the plunger.

6. Remove the 1/8" drift pin, refill assembly with SAE 10 oil.
7. Install the push rod seat and inertia valve assembly.
8. Install the push rod seat retainer, press down on the push rod seat and remove the 1/16" drift pin from the oil holes. The lifter is now completely assembled, filled with oil and ready for installation.

CYLINDER, PISTON AND CONNECTING ROD ASSEMBLIES

Disassembly

1. Remove piston assembly from cylinder, by pushing piston through cylinder with the end of a hammer handle (fig. 97).
2. Remove all piston rings by expanding them and sliding them off the top of the pistons. Tool J-8016 is available for this purpose.
3. Install piston and connecting rod assembly on support J-6994-1 and Adapter J-8355-1. Place assembly in an arbor press (fig. 98). Press pin out of connecting rod, using Tool J-8355-3.
4. Remove from press and remove piston pin from support and remove tool from piston and rod.

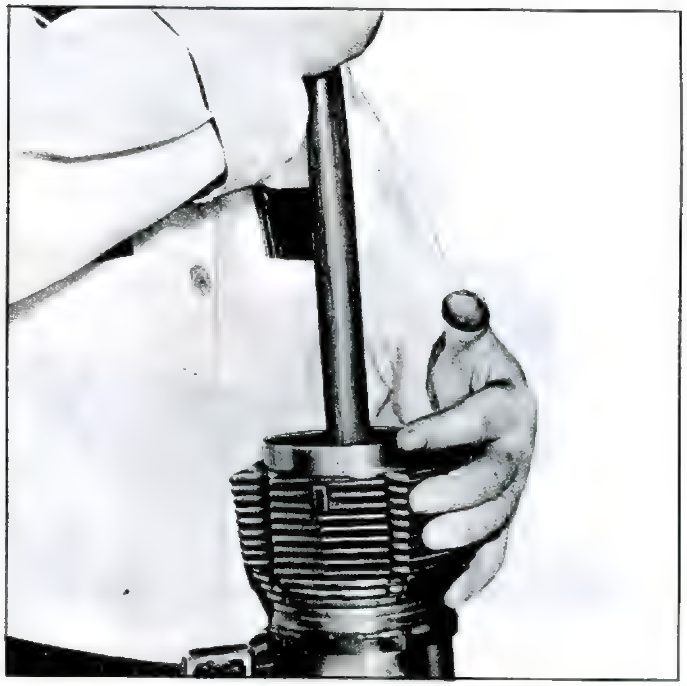


Fig. 97—Removing Piston from Cylinder

Cleaning and Inspection

Cylinder

NOTE: Ridge and/or deposits on the head end of the cylinder can be removed after piston is

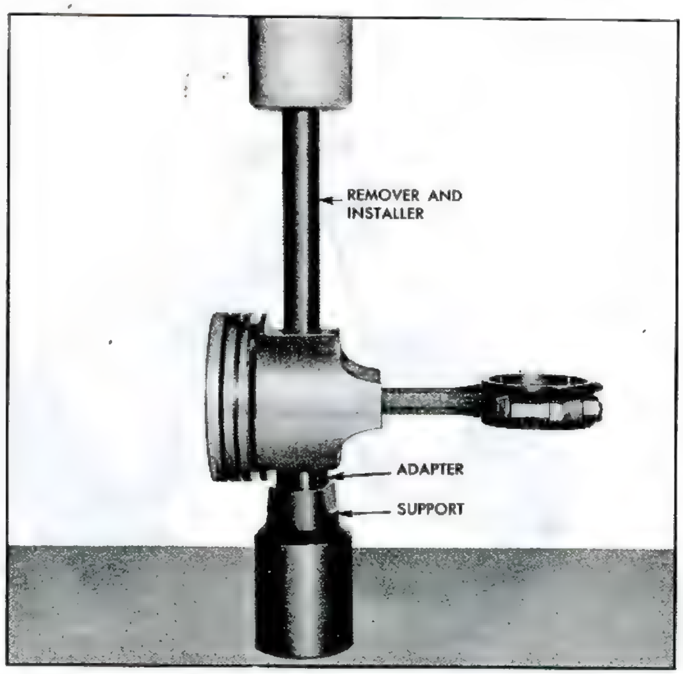


Fig. 98—Removing Piston Pin

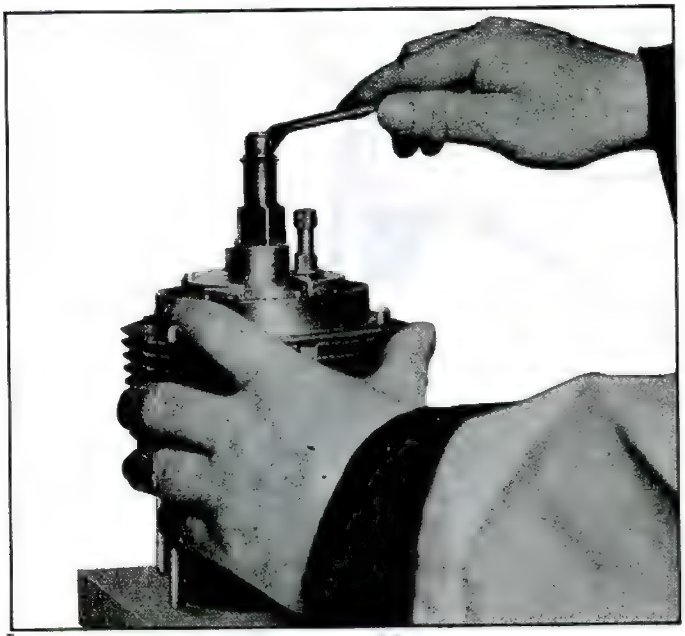


Fig. 99—Removing Ridge from Cylinder

removed from cylinder. A cylinder mounted ridge reamer is available at local jobbers.

1. Using a block of wood for a fixture, drill two holes, spaced to provide a location for two long bolts, holes should be small enough to require driving the bolts into the block of wood.
2. Clamp wood block fixture in a suitable vise.
3. Install cylinder over bolts on wood fixture. Holding cylinder with one hand, insert ridge reamer and remove ridge and/or carbon from cylinder (fig. 99).

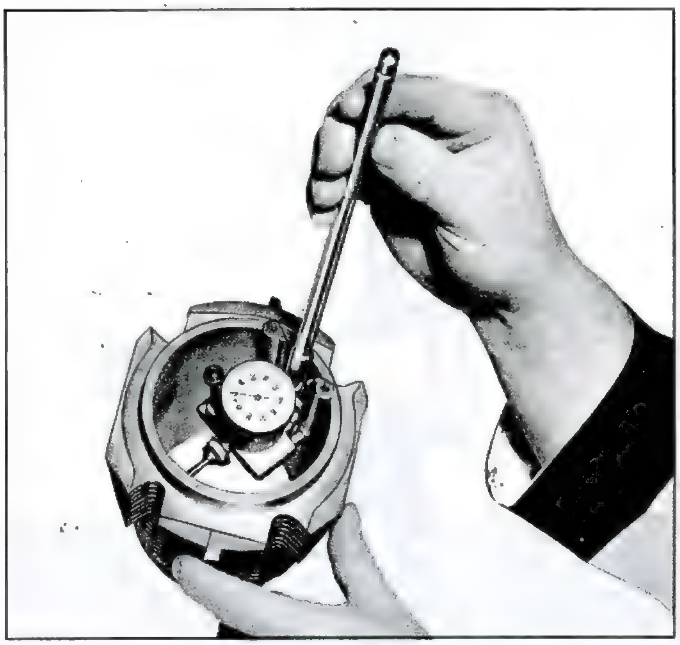


Fig. 100—Measuring Cylinder Bore

4. Measure the cylinder walls for taper, out-of-round or excessive ridge at the top of ring travel. This can be done with Tool J-8087 (fig. 100). Set gauge so that thrust pin must be forced in about 1/4" to enter gauge in cylinder bore. Center gauge in cylinder and turn dial to "O". Carefully work gauge up and down cylinder to determine taper and turn it to different points around cylinder wall to determine the out-of-round condition.

   If the cylinders were found to have taper or wear in excess of .005" the cylinder and piston must be replaced.

   NOTE: Cylinders and pistons are serviced as a unit.

Pistons

Clean varnish from piston skirts and pins with a cleaning solvent. DO NOT WIRE BRUSH ANY PART OF THE PISTON. Clean the ring grooves with a groove cleaner and make sure oil ring holes and slots are clean.

Inspect the piston for cracked ring lands, skirts or pin bosses, wavy worn ring lands, scuffed or damaged skirts, eroded areas at top of the piston. Inspect the grooves for nicks or burrs that might cause the rings to hang up. If pistons are damaged or show signs of excessive wear replace cylinder and piston assembly.

Piston Pin

The piston pin clearance is designed to maintain adequate clearance under all engine operating conditions and prevent cylinder and piston pin bore scuffing. Because of this, the piston and piston pin are a matched set and not serviced separately.

Inspect piston pin bores and piston pins for wear. Piston pin bores and piston pins must be free of varnish or scuffing when being measured. The piston pin should be measured with a micrometer and the piston pin bore should be measured with a dial bore gauge or an inside micrometer. If clearance is in excess of specifications and the .001" wear limit, the piston and piston pin assembly should be replaced.

Connecting Rod

Wash connecting rods in cleaning solvent and dry with compressed air.

Check for twisted or bent rods and inspect for fatigue or cracks. Replace connecting rods that are damaged.

Assembly

Piston and Connecting Rods

1. Lubricate piston pin holes in piston and connecting rod to facilitate installation of pin.
2. Position connecting rod in its respective piston.
3. Install piston pin on Installer J-8355-3 and pilot spring Adapter J-8355-1 and pilot in support (fig. 101).
4. Install piston and rod on support, indexing Pilot J-8355-4 through piston and rod.
5. Place support on an arbor press, start pin into position and press on installer until piston pin pilot bottoms.
6. Remove installer and support assembly and adapter from piston and connecting rod assembly.
7. Check piston pin for freedom of movement in piston bore.

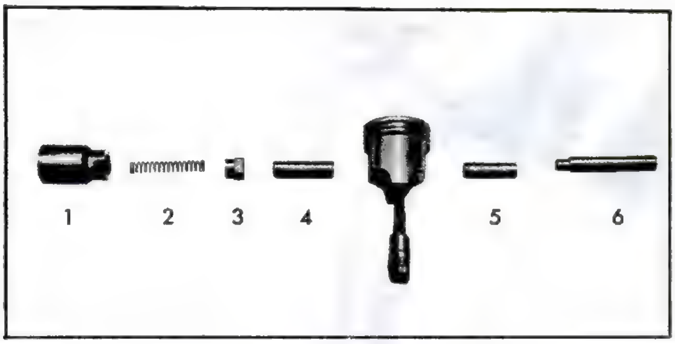


Fig. 101—Piston Assembly and Tool Layout

1. Support
2. Spring
3. Adapter
4. Pilot
5. Piston Pin
6. Installer and Remover

NOTE: Piston pins are a matched fit to each piston and are not available separately.

Piston Rings

All compression rings are marked on the upper side of the ring (fig. 102). When installing compression rings, make sure the marked side is toward the top of the piston. The top ring is chromed for maximum life.

The oil control rings used are of the three piece type, consisting of two segments (rails) and a spacer.

1. Slip the compression ring in the cylinder bore; then using the head of a piston, press the ring down into the cylinder bore about two inches.

   NOTE: Using a piston in this way will place the ring square with the cylinder walls.

2. Measure the space or gap between the ends of the ring with a feeler gauge (fig. 103).

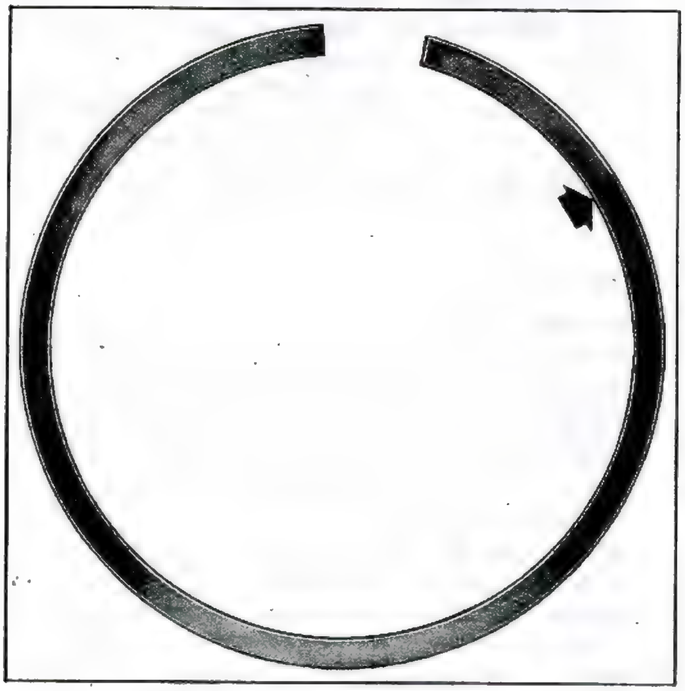


Fig. 102—Compression Ring Marking

Fig. 103—Measuring Ring Gap

3. If the gap between the ends of the ring is below specifications, remove the ring and try another for fit.
4. Fit each compression ring separately to the cylinder in which it is going to be used.
5. If the pistons have not been cleaned and inspected as outlined, do so.
6. Install the oil ring spacer in the oil ring groove and position gap so when piston is installed gap will be in line with engine bottom. (Anti-rotation tang will lock in oil slot.) Hold spacer ends butted and install steel rail on lower side of spacer. Position gap so when piston is installed gap will be in line with top of engine 45° from piston pin (fig. 104), then install

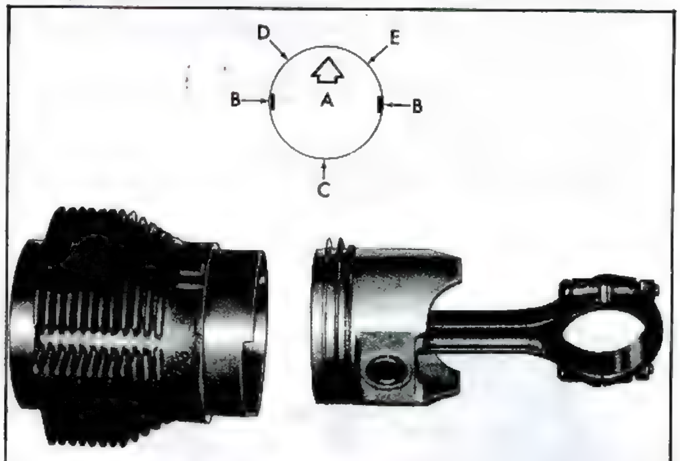


Fig. 104—Piston Rings Installed

A. Top of Piston (Installed)
B. Piston Pin Location
C. Oil Ring Spacer Gap
D. Top Oil Ring Rail Gap, Top Compression Ring Gap
E. Bottom Oil Ring Gap, Second Compression Ring Gap

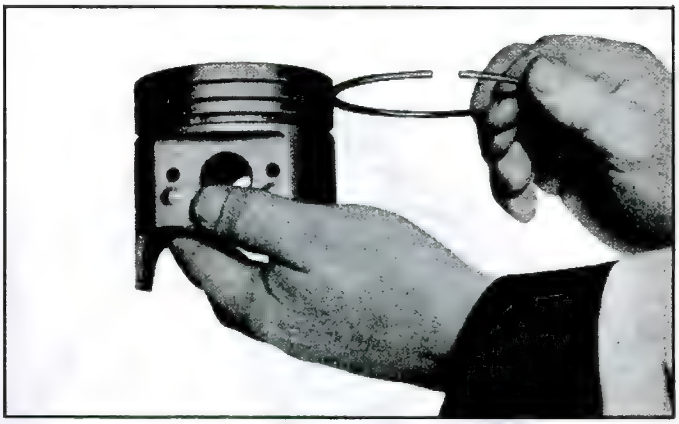


Fig. 105—Rolling Ring in Groove

second rail on upper side of spacer. Position gap so when piston is installed gap will be in line with top of engine 90° from lower rail (fig. 104).

7. Flex the oil ring assembly in its groove to make sure ring is free and does not bind in the groove at any point. If binding occurs, the cause should be determined and removed by carefully dressing with a fine cut file. However, if the binding is caused by a distorted ring, check a new ring.
8. Slip the outer surface of the second compression ring into the piston ring groove and roll the ring entirely around the groove to make sure that the ring is free and does not bind in the groove at any point (fig. 105). If binding occurs, the cause should be determined and removed by carefully dressing with a fine cut file. However, if the binding is caused by a distorted ring, check a new ring. Install ring and position gap so when piston is installed gap will be in line with top of engine 45° from piston pin (fig. 104).
9. Repeat above step for top compression ring and position ring gap 90° from second compression ring gap (fig. 104).

   NOTE: TOOL J-8016 is available for installing compression rings.

10. Proper clearance of the piston ring in its piston ring groove is very important to provide a proper ring action and reduce wear. Therefore, when fitting new rings, the clearances between the top and bottom surfaces of the ring grooves should be measured (fig. 106). (See Specifications.)

Fig. 106—Measuring Ring Groove Clearance

Fig. 107—Installing Piston in Cylinder

Cylinder

1. Apply a light coat of engine oil to the piston rings.
2. Install piston ring compressor Tool J-8037 over the piston and rings. Tighten snugly and insert piston and connecting rod assembly into the respective cylinder bore (Corresponding number).
3. Push piston assembly in with a hammer handle, while holding cylinder bore in one hand until it is slightly below the top of the cylinder bore (fig. 107).

   NOTE: Notch on piston top must be installed, towards the front of engine (flywheel end) on both banks.

CRANKCASE

Cleaning and Inspection

1. Remove two oil gallery plugs located at flywheel housing end of crankcase. These oil gallery passages should be thoroughly cleaned with cleaning solvent.
2. Check cylinder pilot bores and bearing surfaces in each half of crankcase for nicks, cracks or other damage that would interfere with the proper fit of component parts.

   NOTE: Do not use scrapers or other sharp tools to clean gasket surfaces. A good cleaning solvent should be used to dissolve gasket material or varnish that may adhere to surfaces.

   NOTE: The crankcase unit is serviced with all main bearings installed. Crankcase studs must be installed or transferred.

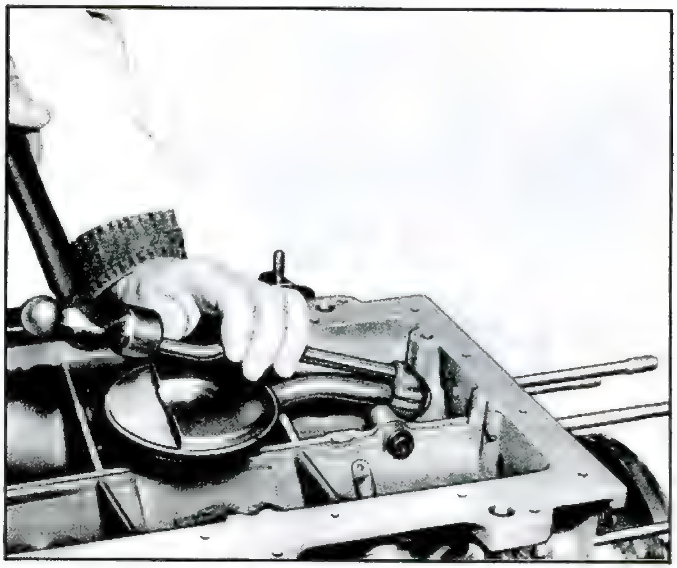


Fig. 108—Installing Pick-Up Screen and Tube

Repairs

Oil Pump Screen and Tube Replacement (Fig.)

1. Using Tool J-8369 remove oil pump screen and tube from left crankcase half.

   CAUTION: Before installation of oil pump screen and tube, the end of the tube (on the outside diameter) must be tinned.

2. Using Tool J-8369, install oil pump screen and tube in the left crankcase half. The screen must be positioned parallel to the oil pan rail.

Oil Dipstick Tube Replacement

The oil dip stick tube can easily be replaced by driving tube out from oil pan side with a hardwood block and hammer. Install a new oil level gauge tube using Permatex anti-seize compound or equivalent on the leading surface and tap oil level gauge tube into crankcase with block of wood and hammer until rolled ring bottoms at the crankcase.

Stud Replacement

Always use Permatex #404 anti-seize compound or its equivalent on all threads entering aluminum.

1. To install crankcase studs, install long cylinder studs to a projected length of 8-9/32" and short cylinder studs to a projected length of 7-9/16" (fig. 110) using Tool J-8354-1 (3/8-24) (fig. 109). For easy measuring of stud installed length, measure from Tool J-8354-1-2-3 shoulder.

   NOTE: Cylinder stud torque should be a maximum of 30 ft. lbs. and a minimum of 10 ft. lbs. Under 10 ft. lbs. another selected stud should be used.

   Studs are available for service in the following oversizes, .003" and a.006".

   NOTE: All cylinder studs installed in the crankcase adjacent to the crankcase main bearing webs have blind holes, while all other cylinder studs entering the crankcase do not.

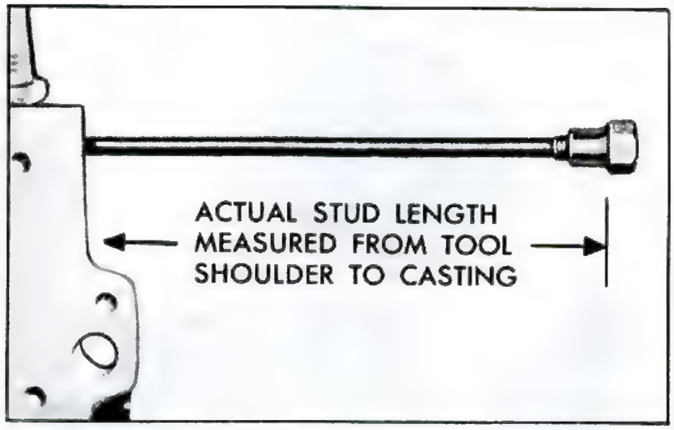


Fig. 109—Installing Studs

2. Install engine rear mounting bracket studs, to a projected length of 4-9/16" (fig. 110) using Tool J-8354-3 (3/8"-16).

   NOTE: Rear mounting bracket studs should be torqued 5 ft. lbs. minimum.

Thread Repair

Inserts are commercially available for thread repairs at local jobbers and should be installed to prescribed methods furnished by the manufacturer.

OIL FILTER AND DELCOTRON ADAPTER

Cleaning and Inspection

1. Wash all parts in cleaning solvent and dry with compressed air.
2. Inspect gasket surface for nicks or scratches.
3. Inspect oil filter by-pass valve for damaged valve or spring.
4. Inspect for cracks at flange for mounting Delcotron.

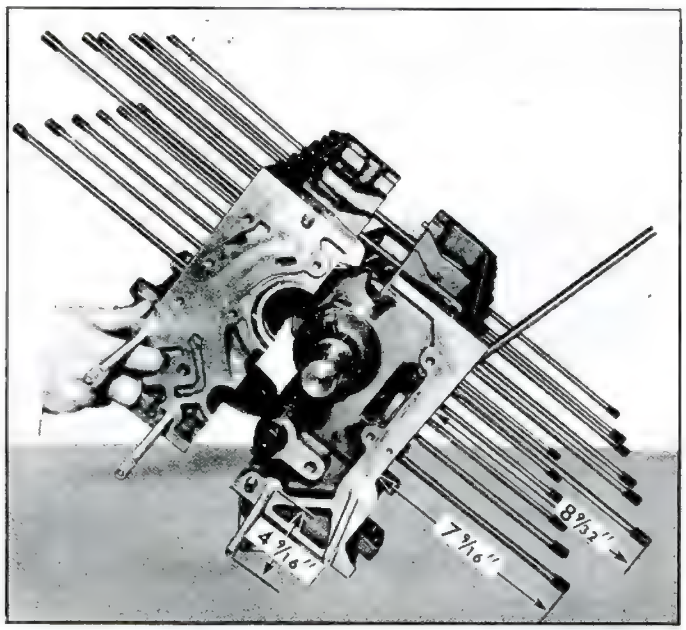


Fig. 110—Stud Installed Length

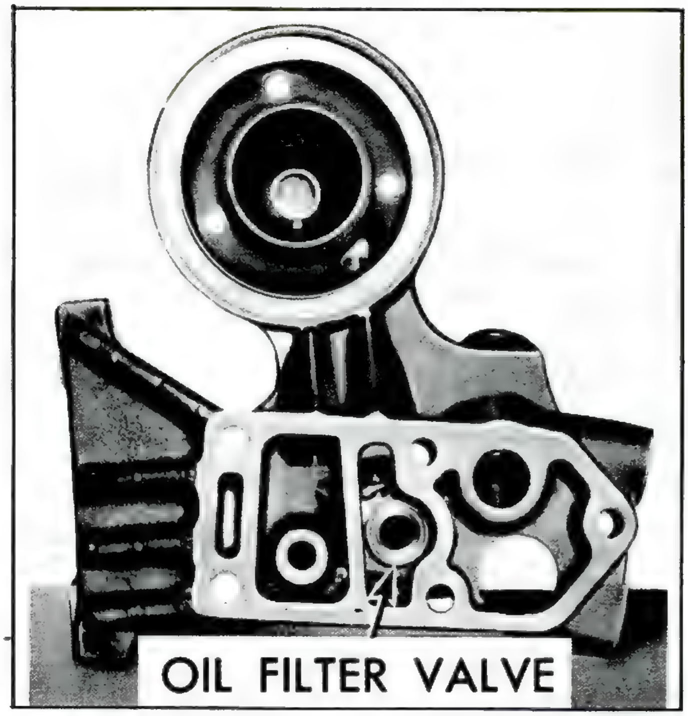


Fig. 111—Oil Filter By-Pass Valve

Repairs

Oil Filter By-Pass Valve Replacement

NOTE: The oil filter by-pass valve opens at 10 psi.

1. Remove oil filter by-pass valve from the oil filter and Delcotron adapter by catching the inner edge of the valve with a suitable hook or small screw driver.
2. Install a new oil filter by-pass valve with the spring up in the adapter housing (fig. 111).

Stud Replacement

Install blower belt idler pulley stud to a height of 1-1/4".

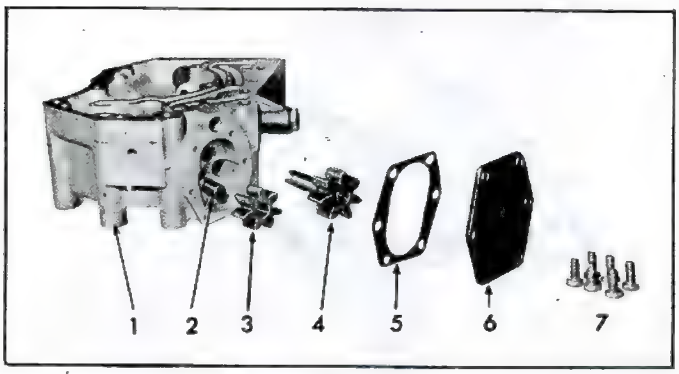


Fig. 112—Oil Pump—Exploded View

1. Engine Rear Housing
2. Idler Gear Shaft
3. Idler Gear
4. Drive Gear and Shaft
5. Gasket
6. Cover
7. Bolts

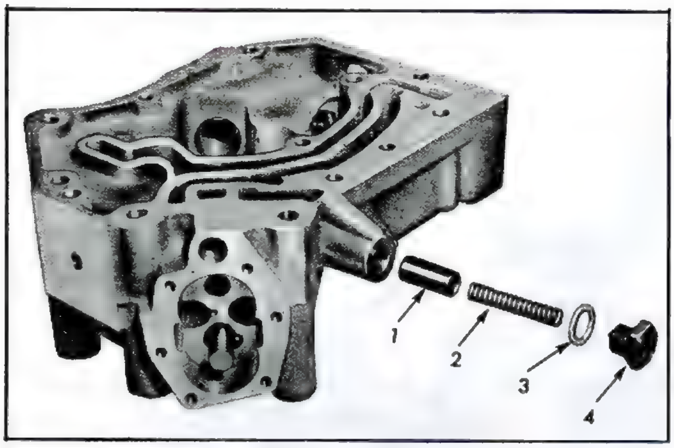


Fig. 113—Pressure Regulator—Exploded View

1. Valve
2. Spring
3. Gasket
4. Plug

ENGINE REAR HOUSING

Disassembly

1. Remove pump cover attaching bolts, cover, gasket, idler gear and drive gear and shaft (fig. 112).
2. Remove pressure regulator plug, gasket, spring and valve (fig. 113).

Cleaning and Inspection

1. Wash all parts in cleaning solvent and dry with compressed air.
2. Inspect engine rear housing gasket surfaces for nicks or scratches.
3. Inspect oil pump gears for wear or damage.
4. Inspect pressure regulator valve for wear or damage.
5. Inspect oil cooler by-pass valve for broken fibre valve or spring.

Assembly

1. Install idler gear on idler gear shaft. Idler gear shaft should be .010" to .020" below gasket surface (without gasket installed).
2. Place drive gear and shaft in pump housing.
3. Check the following measurements: Projection of oil pump gears above gasket surface; .0025"-.0045" (without gasket installed). Clearance between gears and housing; .002"-.005". Gear backlash; .002"-.008".

   NOTE: Since end clearance of oil pump gears is essential to oil pump prime, selective oil pump gears are available in .001" oversize thickness. Lubricate oil pump gears with engine oil before installation.

4. Install pump cover and attaching bolts, and torque to specifications.
5. Insert a long screw driver down the distributor mounting hole in the engine rear housing and turn oil pump drive shaft to see that oil pump turns freely.
6. Install pressure regulator valve, spring, gasket and plug.

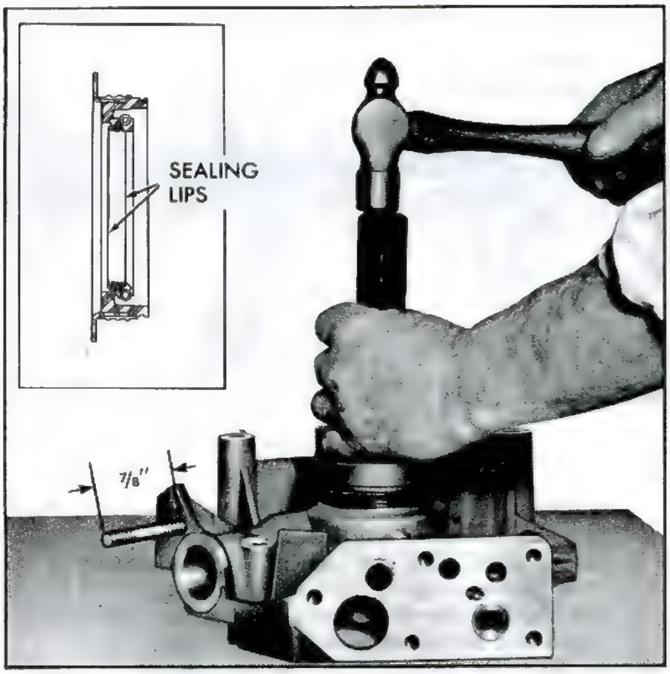


Fig. 114—Installing Rear Housing Seal

Repairs

Seal Replacement

1. Tap seal out of rear housing assembly with a wood or fibre drift.
2. Clean rear housing seal surface with a suitable solvent and check surface for nicks or damage.
3. Lubricate seal outer surface (beaded area) with lubriplate or petrolatum and install with a suitable tool (fig. 114).

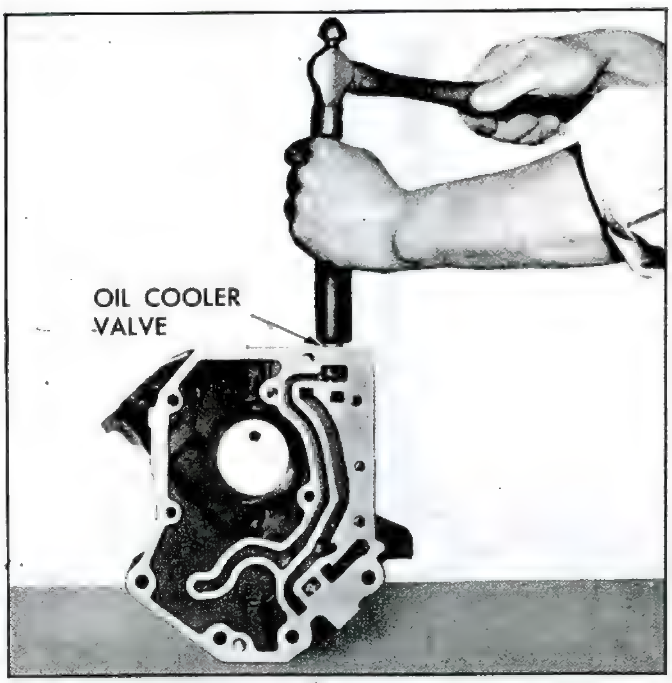


Fig. 115—Installing Oil Cooler By-Pass Valve

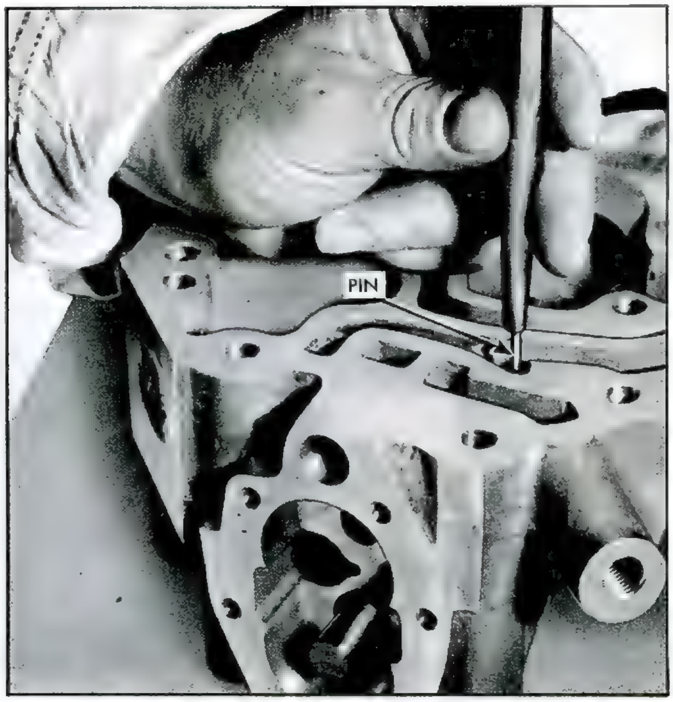


Fig. 116—Installing Pressure Regulator Groove Pin

NOTE: Seal is coated with a high melting (350°F) point cup grease between sealing lips on the inside diameter. Seal to be installed must have this cup grease, which is maintained for the life of the seal.

Oil Cooler By-Pass Valve Replacement

1. Remove oil cooler by-pass valve from the engine rear housing by catching the inner edge of the valve with a suitable hook or small screw driver.
2. Install a new oil cooler by-pass valve with the spring down (fig. 115).

Housing Replacement

When replacing the engine rear housing as a new unit, certain operations are required as outlined below.

1. Install groove pin (fig. 116) which holds oil pump pressure regulator valve in place (if so equipped).
2. Install oil pump gallery plug flush with the counter-bore using sealing compound (fig. 117).
3. Install a new rear housing seal as previously outlined.
4. Install distributor holding stud to a height of 7/8", measured from distributor pad on engine rear housing (fig. 114).

FLYWHEEL HOUSING

Cleaning and Inspection

1. Wash in cleaning solvent and dry with compressed air.
2. Inspect gasket surfaces for nicks or scratches.

Seal Replacement

1. Tap seal out of flywheel housing with a wood or fibre drift.
2. Clean flywheel housing seal surface with a suitable solvent and check this surface for nicks or damage.

Fig. 117—Installing Oil Gallery Plugs

3. Lubricate seal outer surface (beaded area) with lubriplate or petrolatum and install with Tool J-21768 used with Tool J-8092 (fig. 118).

CRANKSHAFT

Cleaning and Inspection

1. Wash crankshaft in solvent and dry with compressed air.
2. Measure dimensions of main bearing journals and crankpin with a micrometer for out-of-round, taper or undersize (see specifications).
3. Check crankshaft for run-out by supporting at the front and rear main bearing journals in "V" blocks and check at the front and rear intermediate journals with a dial indicator (see specifications).
4. Replace or recondition the crankshaft if out of specifications.

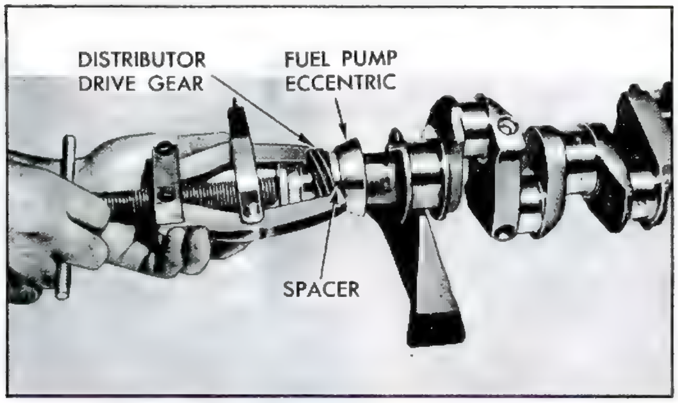


Fig. 119—Removing Distributor Gear

Disassembly

NOTE: Crankshaft end thrust is taken at the rear bearing and crankshaft rear journal flange surfaces.

1. Remove distributor drive gear with Tool J-7112-1 with adapter Tool J-7112-2 (fig. 119).
2. Remove spacer and fuel pump eccentric.

NOTE: Be sure Tool J-7112-1 is on distributor gear solidly, so gear will not be damaged during removal operation.

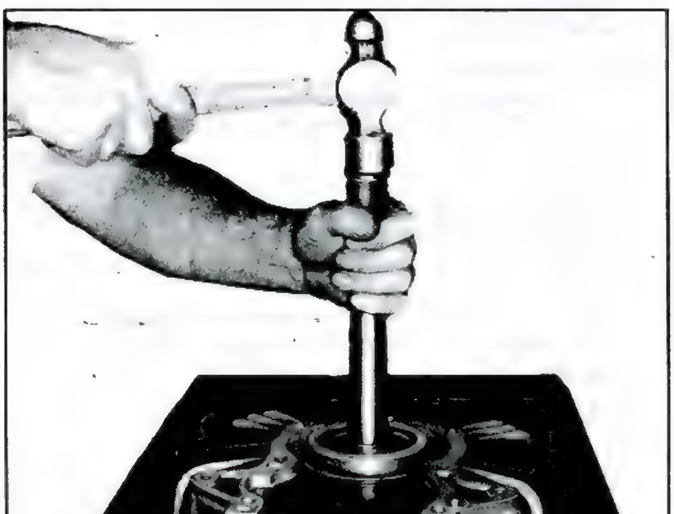


Fig. 118—Installing Flywheel Housing Seal

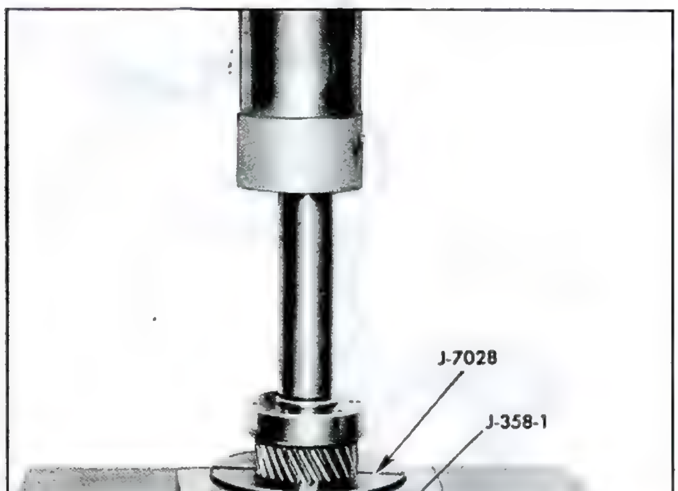


Fig. 120—Removing Crankshaft Gear

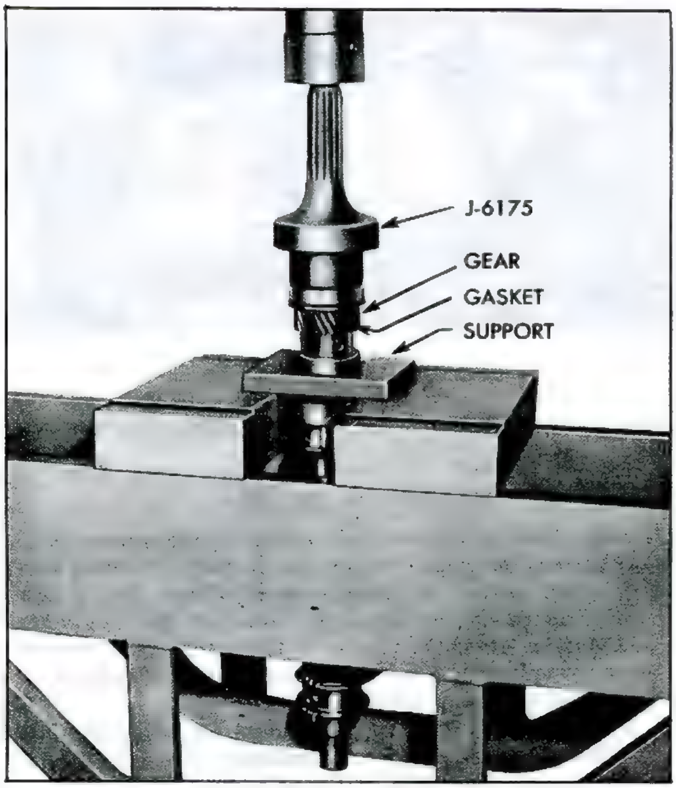


Fig. 121—Installing Crankshaft Gear

3. Remove crankshaft gear by placing each half of Tool J-7028 under gear.
4. Install crankshaft with Tool J-7028 into Tool J-358-1 on a hydraulic press (fig. 120).
5. Remove gear from crankshaft using a small piece of round steel to press crankshaft out of crankshaft gear, then remove and discard gasket.

Assembly

1. Place crankshaft in a hydraulic press and firmly support crankshaft between front crankshaft throw and front journal (fig. 121).

   NOTE: Since the crankshaft gear to crankshaft uses a high press tolerance, a hydraulic press is required for removal and installation.

2. Install new gasket on crankshaft, then lubricate crankshaft with hypoid lubricant, and install woodruff key in shaft keyway.
3. Install crankshaft gear and press into place, using Tool J-6175.
4. Install woodruff keys (two) on rear end of crankshaft (Engine Rear Housing End), one for the fuel pump eccentric and distributor drive gear and the other for the crankshaft pulley. Position fuel pump eccentric and spacer on crankshaft. Lubricate crankshaft and distributor drive gear with engine oil and using Tool J-5590, install distributor drive gear until it bottoms. Install oil slinger with concave side away from distributor drive gear.

MAIN BEARINGS

Main bearings are of the precision insert type and do not utilize shims for adjustment. If clearances are found to be excessive a new bearing, both halves, will be required. Bearings are available in standard size, .001", .002" and (No. 4 only) .003" undersize for use with new and used standard size crankshafts, and in .010" and .020" undersize for use with reconditioned crankshafts.

Inspection

Whenever the crankcase is parted, the bearing inserts and the crankshaft journals should be inspected.

If upon inspection bearing shows evidence of wear or fatigue, both halves should be replaced. Never should one-half be replaced without replacing the other half.

If the running clearance of a bearing is too great with used inserts, it will be necessary to install both bearing halves. Should this become necessary, the crankshaft journal should be checked with a micrometer for out-of-round, taper or undersize dimensions. Experience has shown that clearance increase from wear in main bearings is not only due to bearing wear, but is also due in part to crankshaft journal wear.

Checking Clearance

To obtain the most accurate results with Plastigage, (or its equivalent) a wax-like plastic material which will compress evenly between the bearing and journal surfaces without damaging either surface, certain precautions should be observed. All crankcase bolts must be torqued to specifications. The crankshaft journals and bearings must be wiped clean of oil and crankcase split line surfaces must be free of nicks or foreign matter.

1. Remove one-half of the crankcase, while the other is supported on its side, wipe oil from journal and bearings with a soft clean cloth.
2. Place a piece of gauging plastic the full width of the bearing parallel to the crankshaft on the journal (fig. 122).
3. Install other half of crankcase with bearings and evenly torque all crankcase bolts to specifications.

   CAUTION: Do not rotate the crankshaft while the gauging plastic is between the bearing and journal.

4. Remove one-half of crankcase. The flattened gauging plastic will be found adhering to either the bearing shells or journals. On the edge of gauging plastic packing envelope there is a graduated scale which is correlated in thousandths of an inch.

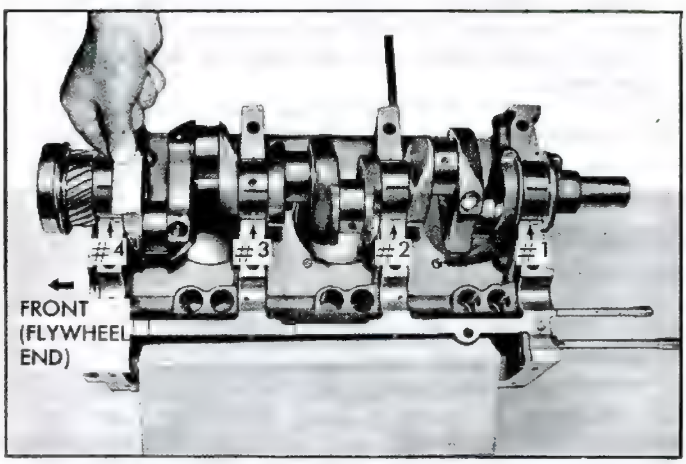


Fig. 122—Measuring Gauging Plastic on Journal

5. Without removing the gauging plastic, check its compressed width (at the widest point) with the graduations on the envelope (fig. 122).

   NOTE: Normally, main bearing journals wear evenly and are not out-of-round. However, if a bearing is being fitted to an out-of-round journal be sure to fit to the maximum diameter of the journal. If the bearing is fitted to the minimum diameter of the journal and the journal is out-of-round .001", interference between the bearing and journal will result in rapid bearing failure. If the flattened gauging plastic tapers toward the middle or ends, there is a difference in clearance indicating a taper, low spot or other irregularity of the bearing or journal. Be sure to measure the journal with a micrometer if the flattened gauging plastic indicates more than .001" difference.

6. If the clearance is not within specifications, replace the bearing.

   CAUTION: Do not install No. 4 main bearing in No. 2 or No. 3 bearing locations. The No. 4 main bearing halves are .0015" thicker than No. 2 and No. 3 main bearings at the ends which are located at the top half of the crankcase and are thinner by the same amount at the opposite ends. This has the effect of lowering the center line of the bearing .0015". The No. 4 main bearing is identified by a brown dye on edges of the bearing shell.

REPLACEMENT BEARINGS

If clearance with gauging plastic is	Install bearing sets
.0010	.000 (Std.)
.0015	.001 U/S
.0020	.001 U/S
.0025	.002 U/S
.0030	.002 U/S
.0035	.003 U/S
.0040	.003 U/S
If these undersize bearings do not produce the proper clearance, it will be necessary to regrind the crankshaft journal for use with the next undersize bearing.	

7. Proceed to each bearing. After all bearings have been checked and installed, rotate the crankshaft to see that there is no excessive drag.

CONNECTING ROD BEARINGS

Inspection

Connecting rod bearings are of the precision insert type and do not utilize shims for adjustment. DO NOT FILE RODS OR ROD CAPS. If clearances are found to be excessive a new bearing will be required. Bearings are available in standard size and .001" and .002" undersize for use with new and used standard size crankshafts, and in .010", .020" and .030" undersize for use with reconditioned crankshafts.

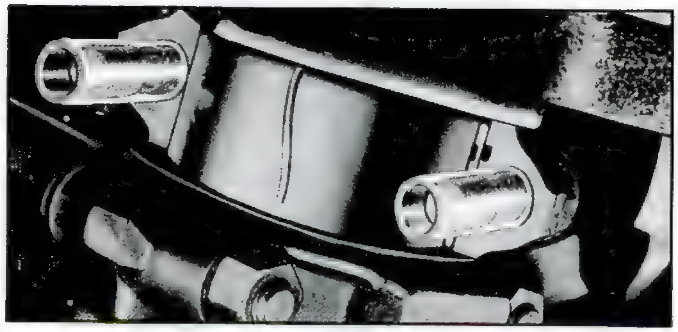


Fig. 123—Gauging Plastic on Crankpin

Checking Clearance

NOTE: Install a piece of plastic hose with 5/16" I.D. over each bolt (fig. 122).

1. Wipe bearing insert shell and crankpin clean of oil.
2. Measure the crankpin for out-of-round or taper with a micrometer. If within specifications and a new bearing is to be installed, measure the maximum diameter of the crankpin to determine new bearing size required. If not within specifications replace or recondition the crankshaft.
3. Place a piece of Plastigage or its equivalent the full width of the bearing or crankpin, parallel to the crankshaft (fig. 123).

   NOTE: If a bearing is being fitted to an out-of-round crankpin, be sure to fit to the maximum diameter of the crankpin. If the bearing is fitted to the minimum diameter and the crankpin is out-of-round .001", interference between the bearing and crankpin will result in rapid bearing failure.

4. Reinstall the bearing cap and evenly torque the nuts to specifications.

   CAUTION: Do not turn crankshaft with the gauging plastic installed.

5. Remove the bearing cap and without removing gauging plastic, check its width at the widest point with the scale on the gauging plastic envelope (fig. 124).
6. If the clearances are not within specifications, replace the bearing with the proper undersize bearings.

   NOTE: The insert bearing shells are not adjustable and no attempt should be made to adjust by filing the bearing caps.

Fig. 124—Measuring Gauging Plastic

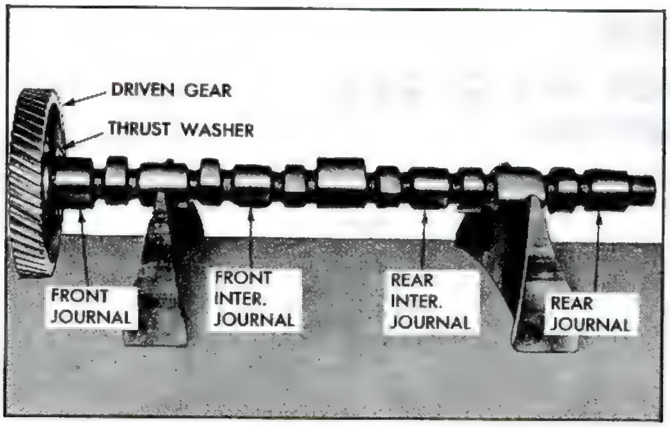


Fig. 125—Checking Camshaft Alignment

7. Rotate the crankshaft after bearing adjustment to be sure the bearings are not too tight.

CAMSHAFT AND TIMING GEAR

Inspection

NOTE: Each exhaust cam lobe serves two exhaust lifters, one on each bank.

1. Check the journals with a micrometer for an out-of-round condition. If the journals exceed .001" out-of-round, the camshaft should be replaced.
2. Check camshaft alignment. The best method is by use of "V" blocks and a dial indicator. The dial indicator will indicate the exact amount the camshaft is out of true. If it is out more than .002" dial indicator reading, the camshaft should be replaced (fig. 125).

NOTE: Camshaft journal clearance should be .0015" to .0035" (new) and .002" to .004" (used). If camshaft clearance is beyond these limits either the crankcase or camshaft should be replaced.

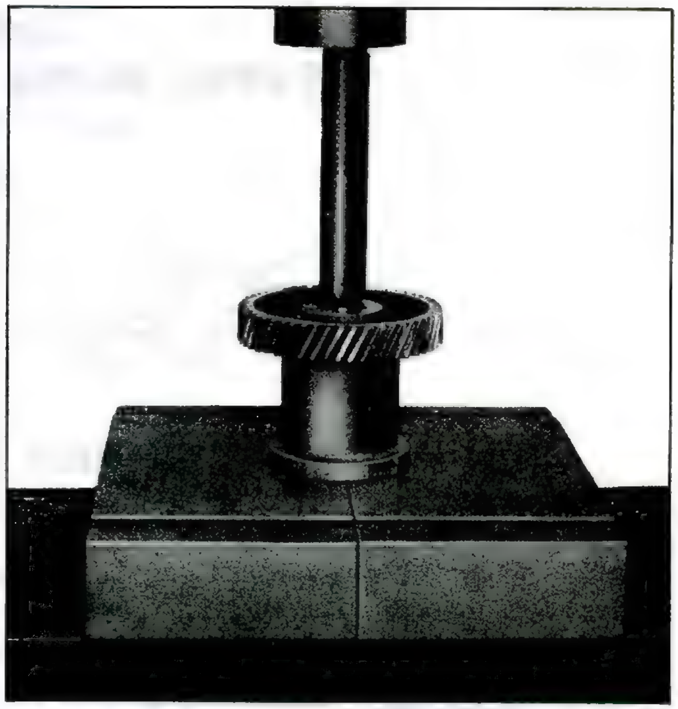


Fig. 126—Removing Camshaft Gear

Disassembly

1. Install Tool J-971 under camshaft gear and place assembly in an arbor press to remove camshaft gear (fig. 126).
2. Remove camshaft gear then remove woodruff key and thrust washer.

Assembly

1. Firmly support shaft at back of the front journal in an arbor press.
2. Place thrust washer over end of shaft, and install woodruff key in shaft keyway.
3. Lubricate camshaft with hypoid lubricant. Install camshaft gear on camshaft and press into place.

CORVAIR
10700 SERIES AND R.P.O. L63
(4 x 1 CARBURETORS)

INDEX

GENERAL DESCRIPTION

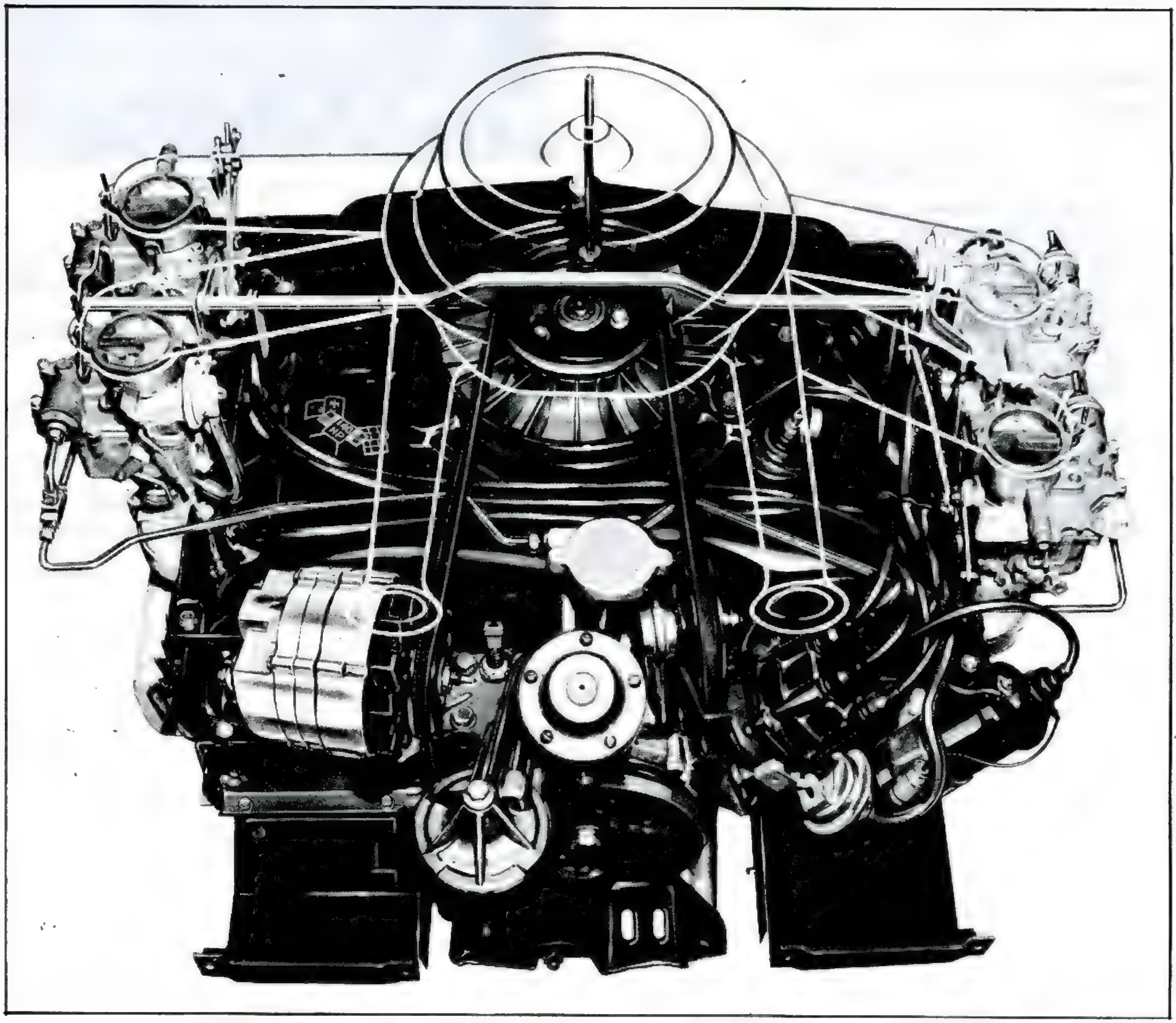


Fig. 127—Corsa Engine (4 x 1 Carburetor)

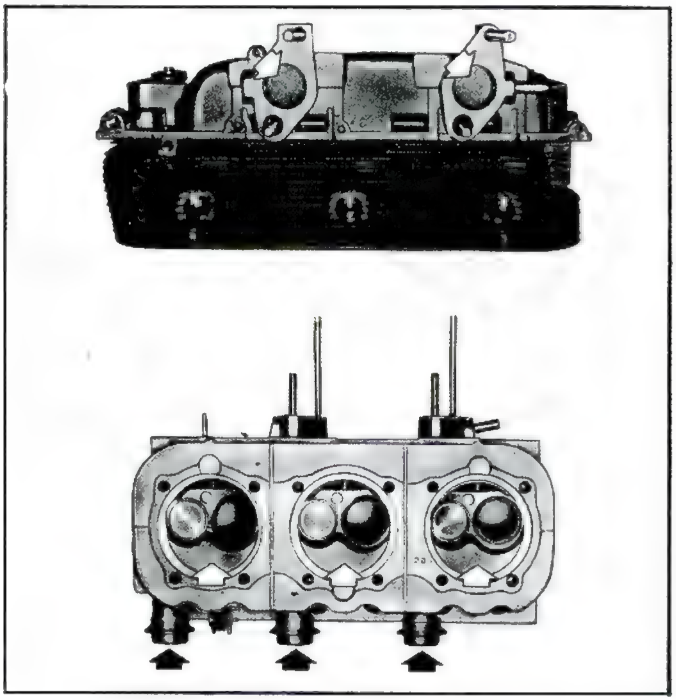


Fig. 128—Cylinder Head

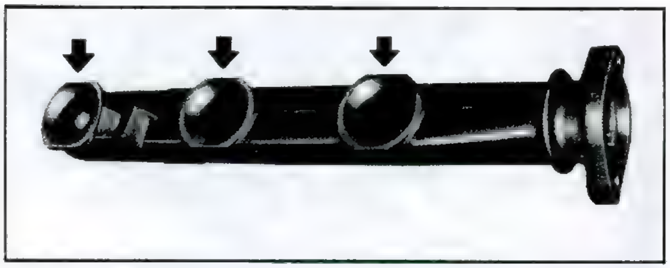


Fig. 129—Exhaust Manifold

The special hi-performance engine (fig. 127) used on the Corvair (10700 series) and optional on the 10100 and 10500 series Corvair has larger exhaust manifolds (fig. 129), a special camshaft and cylinder head with larger valves, larger exhaust port tubes and larger intake manifolds with cast mounting pads for four single barrel carburetors (fig. 128). The engine also has special piston rings and crankshaft (same as turbocharged engine) and a 12 platė oil cooler.

Service and repair procedures remain basically the same as for the 10100 and 10500 series Corvair, except for the service procedures outlined. For carburetor service and carburetor removal for access to engine components refer to Section 6M.

SERVICE PROCEDURES

TUNE-UP

Tune-up procedures for the 10700 series Corvair engine (4 x 1 carburetors) are basically the same as outlined for the 10100 and 10500 series Corvair engine except for the mechanical carburetor synchronization.

Carburetor Synchronization

1. Synchronize the primary carburetors as outlined under Carburetor Synchronization, Mechanical Adjustments in Engine Tune-up for the 10100 and 10500 series Corvair.
2. Disconnect left and right secondary carburetor actuating rods at the cross-shaft levers.
3. Disconnect the accelerator return spring and rotate accelerator control lever on cross-shaft until primary carburetors are at full throttle position.

   CAUTION: Do not actuate cross-shaft at any linkage point other than the accelerator control lever on the cross-shaft. To do so may disturb primary carburetor synchronization.

4. While holding primary carburetors at full throttle position, position left secondary carburetor at full throttle position, then adjust actuating rod by turning rod in swivel until rod will just enter front of slot in cross-shaft lever. (fig. 130).
5. Repeat above step for the right secondary carburetor.
6. Return primary carburetors to the idle position, then connect left and right secondary carburetor actuating rods at the cross-shaft levers.
7. Slowly rotate cross-shaft towards full throttle position, checking for simultaneous engagement of the secondary carburetor actuating rods.
8. Continue to rotate cross-shaft to full throttle position checking that all carburetors reach full throttle position simultaneously.

AIR CIRCULATING PLATE

Air circulating plate (left side only); removed in winter - installed in summer (fig. 131).

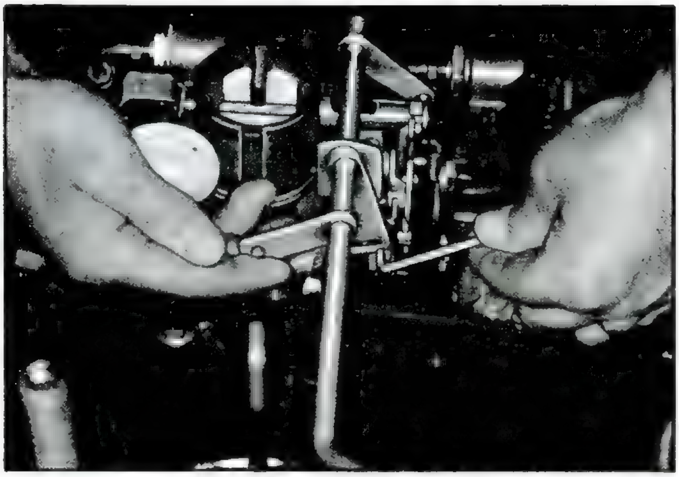


Fig. 130—Synchronization of Secondary Carburetor

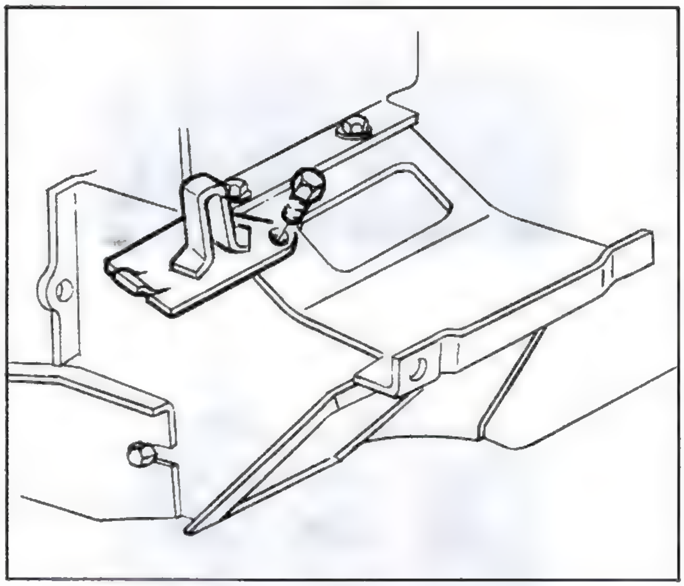


Fig. 131—Air Circulating Plate

CORVAIR WITH TURBOCHARGER

INDEX

GENERAL DESCRIPTION

The optional turbocharged engine (fig. 132) for the 10700 series Corvair has external changes to provide for mounting the Turbocharger and internal changes for the increased power. THE TURBOCHARGER UNIT SHOULD NEVER BE REMOVED FROM THIS SPECIAL ENGINE TO BE INSTALLED ON ANOTHER CORVAIR ENGINE.

Internal changes include the following:

- Piston rings and crankshaft.
- Cylinder heads.
    a. L.H. includes sending unit (Thermister), for head temperature gauge.
    b. R.H. includes Turbocharger oil drain.
    c. 8:1 compression ratio.

External changes include the following:

- 12 plate oil cooler.
- Single side draft Carter YH carburetor.

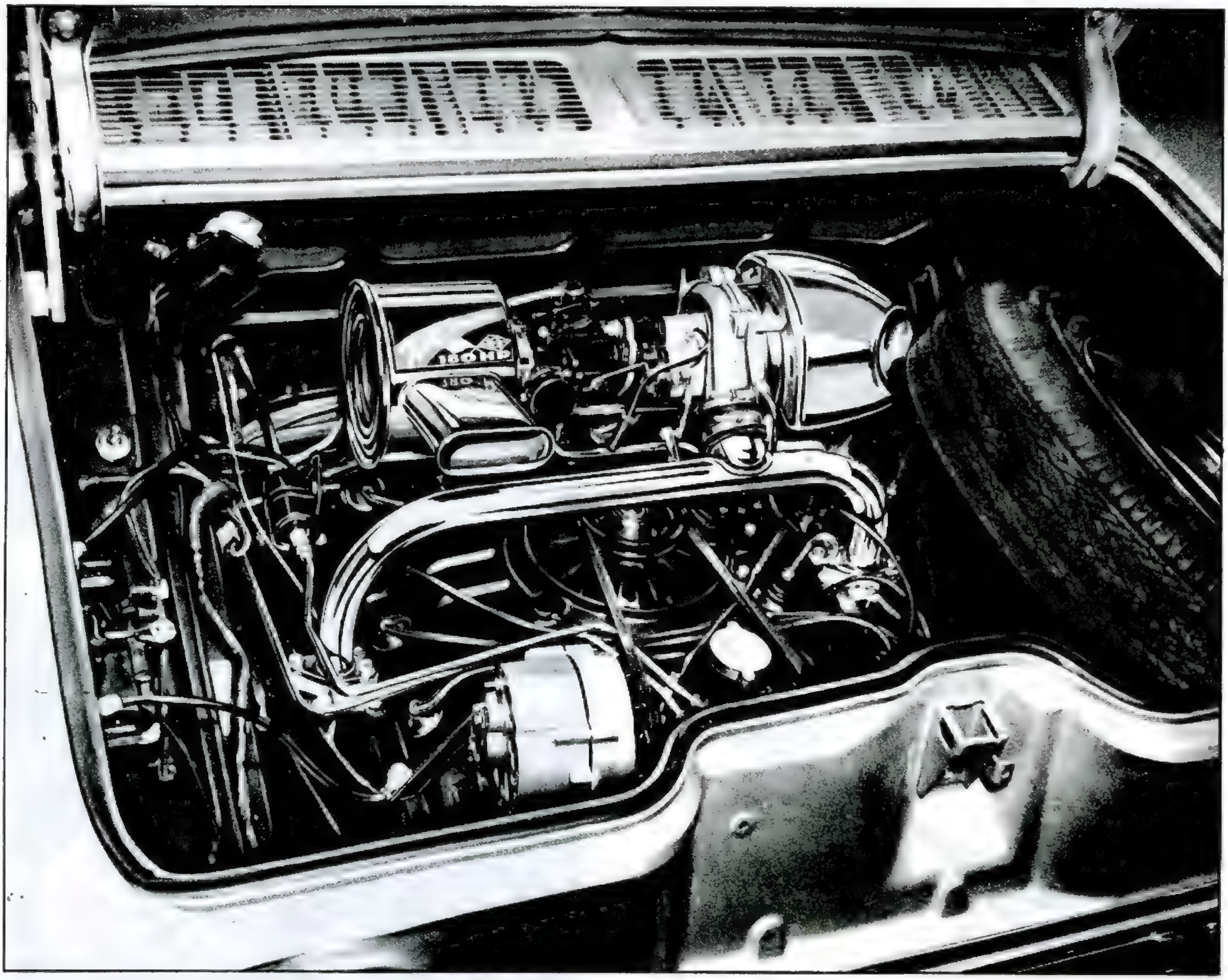


Fig. 132—Turbocharged Engine (Installed)

- Fuel lines and routing.
- Distributor assembly and timing tab.
- Front and right side seal shield revised to bring exhaust pipes to Turbocharger.
- R.H. heater duct revised for exhaust pipe clearance.
- Exhaust pipes and muffler.
- Front shield material (heat resistant) on right side and heat insulator material around exhaust pipes.
- Wiring harness changed to include heat indicator and warning buzzer system.
- Engine rear housing gasket and oil filter adapter changed to provide oil feed to the Turbocharger.
- Air recirculation— same as air conditioned Corvair vehicles.

Since the Turbocharger is an exhaust driven compressor, refer to Section 8 for Exhaust Service Procedures.

SERVICE PROCEDURES

ENGINE TUNE-UP

Engine Tune-up remains basically the same as outlined for the Corvair 10100 and 10500 series except for the procedures outlined.

Accelerator Linkage Adjustment (Fig. 133)

This adjustment must be performed with the engine at operating temperature or with air cleaner off to block choke valve open (engine stopped).

1. Disconnect accelerator rod swivel (3) from cross-shaft lever (4).
2. Check throttle lever to see that it is against idle speed screw, then check to see that linkage angle "X" is approximately 126° as shown in Figure 9-5. Adjust this angle by lengthening or shortening rod (1).
3. Pull accelerator rod (5) rearward against bellcrank stop on transmission and rotate lever (4) to full throttle position (throttle lever on carburetor will rest against stop boss on flange).
4. Adjust swivel (3) to just enter the hole in lever (4), then connect swivel to lever and install retaining clips.

   NOTE: It is better for swivel pin to be just short of lever hole than just past, or linkage may be bent.

5. Move accelerator rod from idle to full throttle and check to see that the throttle lever on carburetor goes to full throttle and back to idle with no bind.

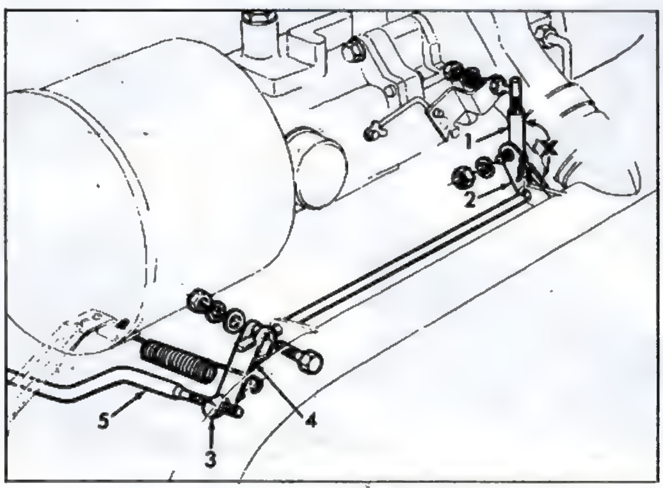


Fig. 133—Accelerator Linkage

Idle Speed and Mixture Adjustment

1. Start engine and bring to operating temperature.
2. Stop the engine and perform following preliminary adjustments:
   a. Back idle speed screw away from throttle lever, then adjust in until the throttle valve is slightly open.
   b. Turn idle mixture screw lightly to its seat and back out 3/4 turn.
   c. Attach tachometer at coil and vacuum gauge at manifold connection for distributor.
3. Make sure the fast idle linkage is off fast idle. This can be determined by removing air cleaner and looking at choke valve. It should be wide open.
4. Start engine and adjust idle speed screw to obtain speed of 850 rpm, then adjust mixture screw and speed screw (alternately as needed) to obtain the highest steady vacuum at 850 rpm.
5. Stop engine, disconnect instruments and reconnect distributor pressure retard hose.

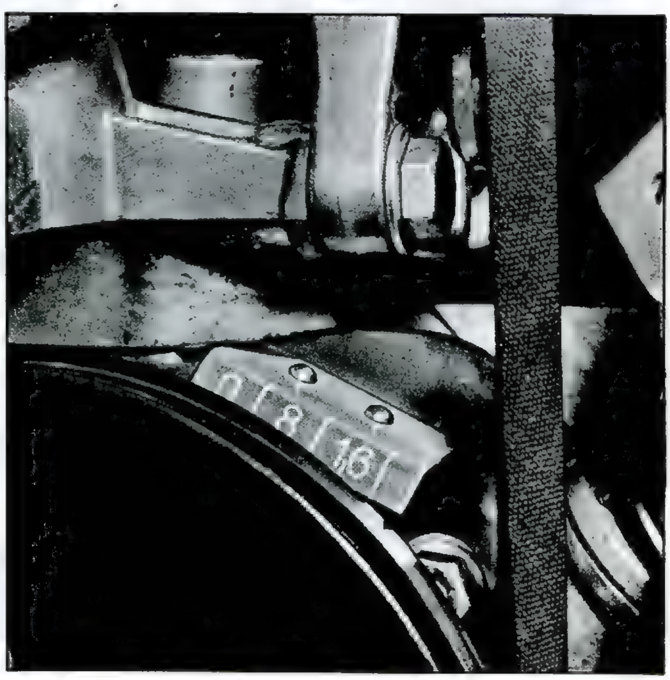


Fig. 134—Ignition Timing

Automatic Choke Adjustment

The automatic choke setting is index and accomplished by loosening three choke coil housing retaining screws and rotating (by hand) the housing; then hold in position and tighten the screws.

Adjust Ignition Timing

1. Connect tachometer and timing light to engine.
2. Start engine and adjust idle (if necessary) to 850 rpm (with engine at operating temperature).
3. Aim timing light at timing tab (fig. 134) above crankshaft pulley and adjust timing to 24° advance by turning distributor the same manner as on regular Corvair engine.

   CAUTION: Under no conditions should the timing be set more than 24° advance.

   NOTE: It is not necessary to disconnect the spark advance hose and block the vacuum port on this engine.

4. Stop engine and disconnect test instruments.

UPPER SHROUD

Upper shroud removal requires removal of Turbocharger (outlined in Section 6M), turbine inlet and exhaust piping, turbocharger oil lines, and diffuser tube as outlined. Shroud may then be removed in the same manner as outlined for 10100 and 10500 series.

LEFT SHIELD

Left shield is removed as outlined for 10100 and 10500 series, after removal of fuel filter and disconnection of manifold pressure line.

RIGHT SHIELD

Right shield is removed as outlined for 10100 and 10500 series after removing exhaust insulator plate screws and sliding the plate upward 1/2" to 1" clearance.

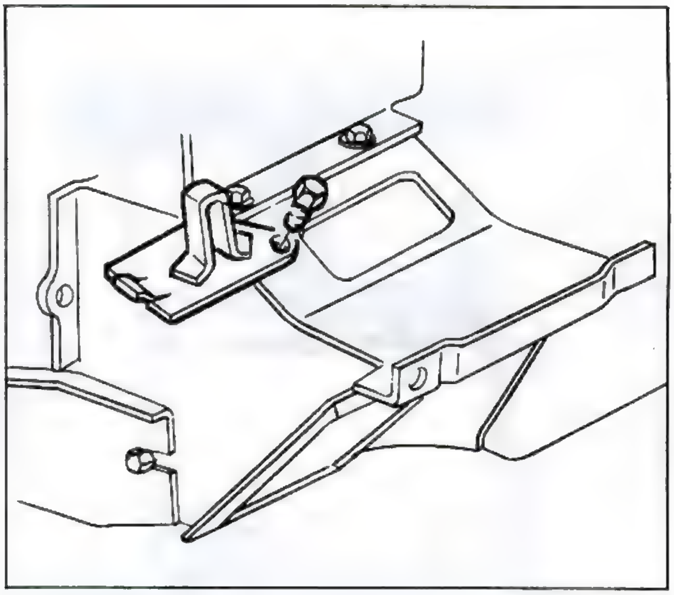


Fig. 135—Air Circulating Plate

FRONT SHIELD

Front shield is removed as outlined for 10100 and 10500 series, after removal of Turbocharger assembly, (including carburetor and air cleaner) and removal of the fuel filter.

AIR CIRCULATING PLATES

Air circulating plate (left side only); removed in winter - installed in summer (fig. 135).

SPECIAL TOOLS

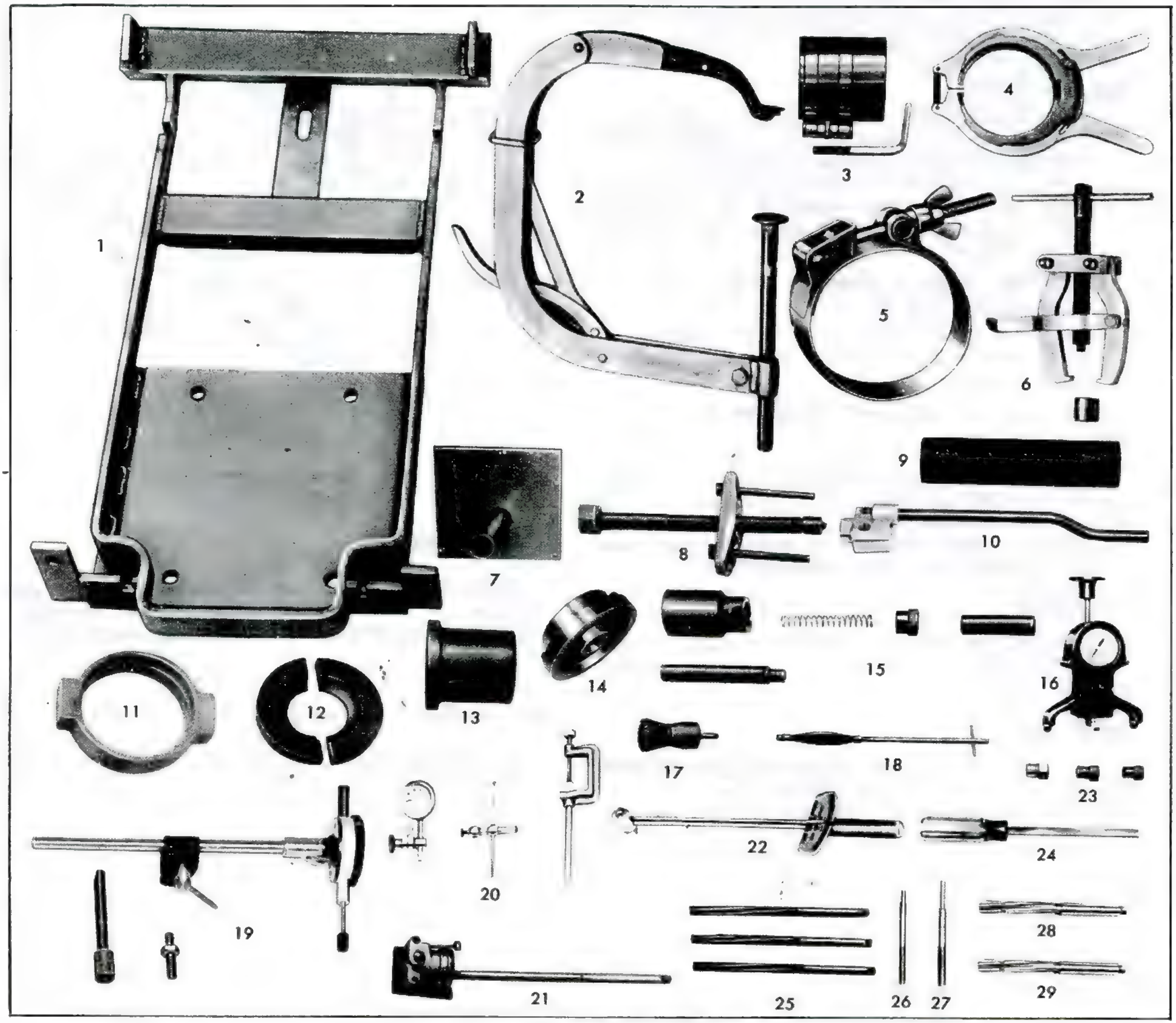


Fig. 136—Engine Special Tools

1. J-7894 Power Train Cradle
2. J-8062 Valve Spring Compressor
3. J-8037 Piston Ring Compressor
4. J-8016 Piston Ring Expander
5. J-8356 Piston Ring Compressor
6. J-7112 Puller (Distributor Drive Gear)
7. J-8280 Engine Stand Adapter
8. J-8105 Crankshaft Pulley Remover
9. J-5590 Installer (Distributor Drive Gear)
10. J-8369 Oil Pick-Up Screen Installer
11. J-358 Press Plate Holder
12. J-7028 Press Plate Tool
13. J-971 Camshaft Gear Support
14. J-21768 Seal Installer (Used with J-8092)
15. J-8355 Piston Pin Assy. Tool (Used with J-6994)
16. J-7316 Tension Gauge (Blower Belt)
17. J-8358 Carbon Remover Brush
18. J-8101 Valve Guide Cleaner
19. J-8520 Indicator Set (Camshaft Lobe)
20. J-8001 Indicator Set (Universal)
21. J-8087 Indicator Set (Cylinder Bore)
22. J-1264 Torque Wrench (0-200 Ft. Lb.)
    J-8058 Torque Wrench (0-50 Ft. Lb.)
    J-5853 Torque Wrench (0-100 In. Lb.)
23. J-8354 Stud Replacer Tool Set
24. J-21308 Fin Cleaning Tool
25. J-5830 Valve Guide Reamer Set
26. J-21280 Valve Guide Remover
27. J-21281 Valve Guide Installer
28. J-21282 Valve Guide Bore Reamer (.010")
29. J-21282 Valve Guide Bore Reamer (.020")

SECTION 6M

ENGINE FUEL

CONTENTS OF THIS SECTION

CARBURETORS

ROCHESTER HV

INDEX

GENERAL DESCRIPTION

This section covers the two identical Rochester HV Carburetors (fig. 1) used on Corvair 10100 and 10500 series and also used as primary carburetors on the Corvair 10700 series (4 x 1 Carburetors).

SERVICE PROCEDURES

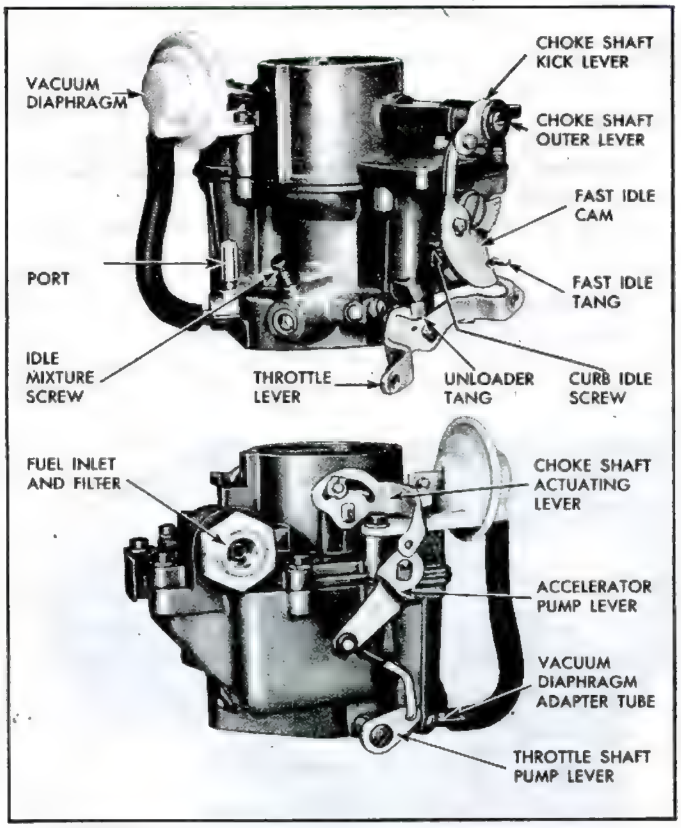


Fig. 1—Rochester HV Carburetor

For Carburetor Synchronization, Idle Speed and Mixture Adjustment and Choke Adjustment refer to Section 6, Engine Tune-Up.

Additional Checks and Adjustments

The following checks and adjustments may be made without removing the carburetor from the vehicle. Refer to Repair Procedures, Assembly and Adjustments.

- Float Adjustments
- Pump Rod Adjustment
- Vacuum Break Adjustment
- Choke Unloader Adjustment

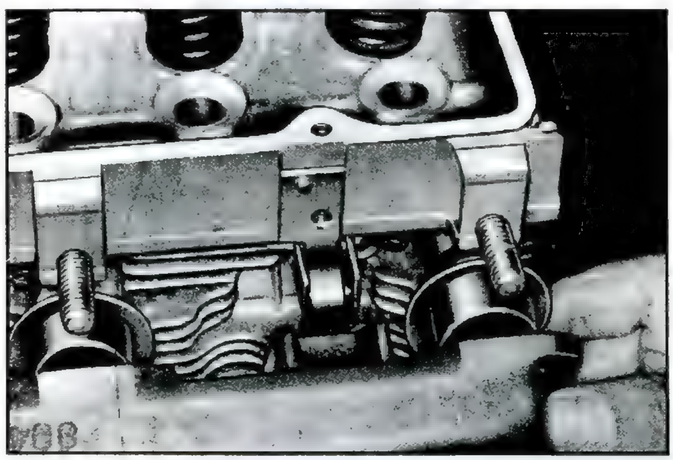


Fig. 2—Choke Coil Mounting

- Fast Idle Cam Adjustment
- Vapor Vent Adjustment

Choke Coil Replacement

1. Disconnect and remove upper choke control rod.
2. Remove engine lower shroud as outlined in Section 6.
3. Using a sharp chisel and hammer, with light blows, (hard blows will snap head off rivet), tap head of twist rivet in a counter-clockwise direction until rivet starts out.
4. Grip head of twist rivet with vise-grip pliers and remove by turning counter-clockwise.
5. Remove choke coil and control rod assembly from cylinder head (fig. 2).
6. Remove control rod from choke coil and install in new choke coil.
7. Position choke coil and control rod assembly in cylinder head and tap twist rivet in place with a hammer.
8. Install lower shroud as outlined in Section 6.
9. Install, adjust and connect upper choke control rod as outlined in Section 6, Engine Tune-Up.

REPAIR PROCEDURES

Removal

1. Remove air cleaner assembly.
2. Disconnect choke control rod at each carburetor choke shaft lever.
3. Disconnect accelerator return spring and accelerator rod. Disconnect carburetor rods at carburetor throttle levers.
4. Remove all cross-shaft retainer screws and remove cross-shaft assembly.
5. Disconnect gas inlet line from carburetors.
6. Remove two nuts and washers attaching carburetor to intake manifold studs.
7. Remove vacuum advance hose from right carburetor.
8. Remove carburetor from the mounting studs.

Disassembly

CAUTION: A power enrichment circuit has been added to the 1965 Rochester HV carburetor and care should be taken not to loose the power enrichment needle valve (located under venturi cluster) during carburetor disassembly.

1. Detach clip attaching pump rod to pump lever, remove clip and detach rod from pump lever.
2. Remove fuel inlet nut and gasket and remove filter element and spring.
3. Remove choke trip lever attaching screw and levers from choke shaft.

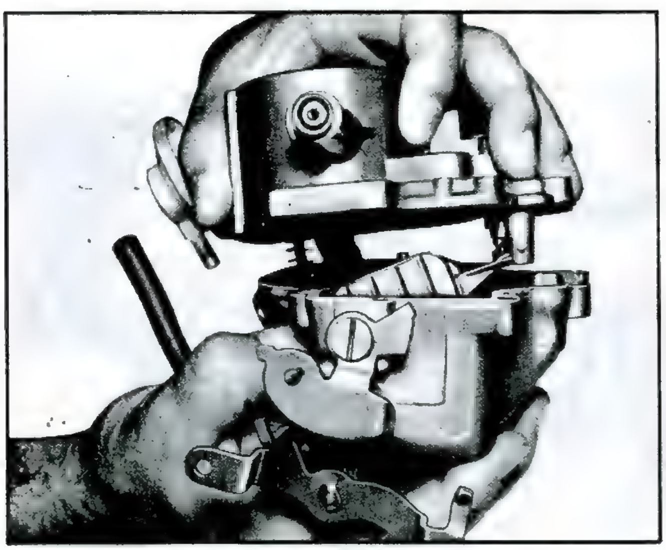


Fig. 3—Removing Bowl Cover

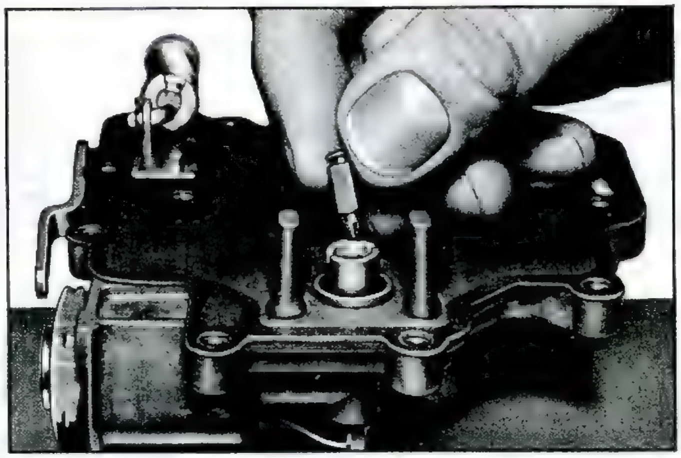


Fig. 4—Removing Float Needle

4. Remove bowl cover attaching screws then remove cover assembly (fig. 3).
5. Remove vacuum diaphragm assembly by rotating assembly to align notch and free it from link.
6. Remove pin attaching floats to bowl cover assembly and check floats for damage.
7. Lift out float needle (fig. 4). Check seat for dirt or corrosion.
8. If necessary, needle seat and gasket may be removed by using a large size screw driver (fig. 5). It may then be cleaned or replaced as needed.
9. Accelerator pump may be removed if necessary. Remove clip and pump. Remove shaft and lever, if

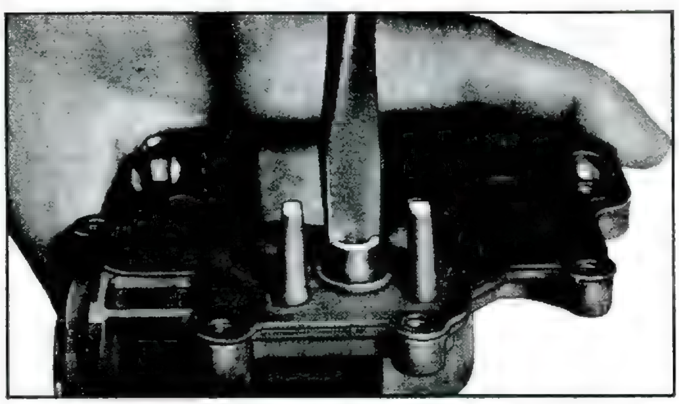


Fig. 5—Removing Needle Seat

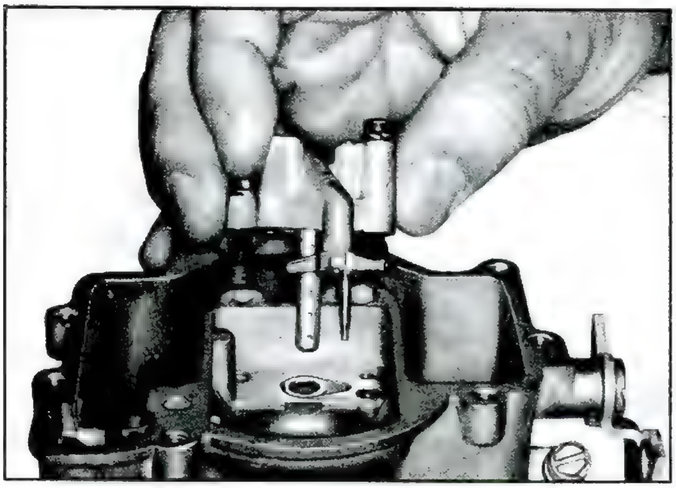


Fig. 6—Removing Venturi Cluster

desired, by removing clip, shaft and lever.

10. Remove the two screws and lock washers attaching venturi cluster to the bowl assembly and lift out the cluster, gasket and main well insert, (fig. 6).
11. Remove the pump discharge needle valve and power enrichment needle valve.
12. Remove the idle mixture adjusting needle and spring. Remove main metering jet.
13. Remove vapor vent assembly.
14. If necessary, remove two choke valve retaining screws and slide choke valve out of choke shaft. Remove choke shaft from carburetor bowl cover.
15. Remove fast idle cam.
16. If necessary, invert carburetor bowl and remove throttle valve retaining screws and remove throttle valve and shaft assembly.

Cleaning and Inspection

Dirt, gum, water or carbon contamination in the carburetor or on the exterior moving parts are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Thoroughly clean carburetor castings and metal parts in clean cleaning solvent.

   CAUTION: Pump plunger and gaskets should never be immersed in carburetor cleaner.

2. Blow out all passages in castings, dry with compressed air and blow out all parts until they are dry.

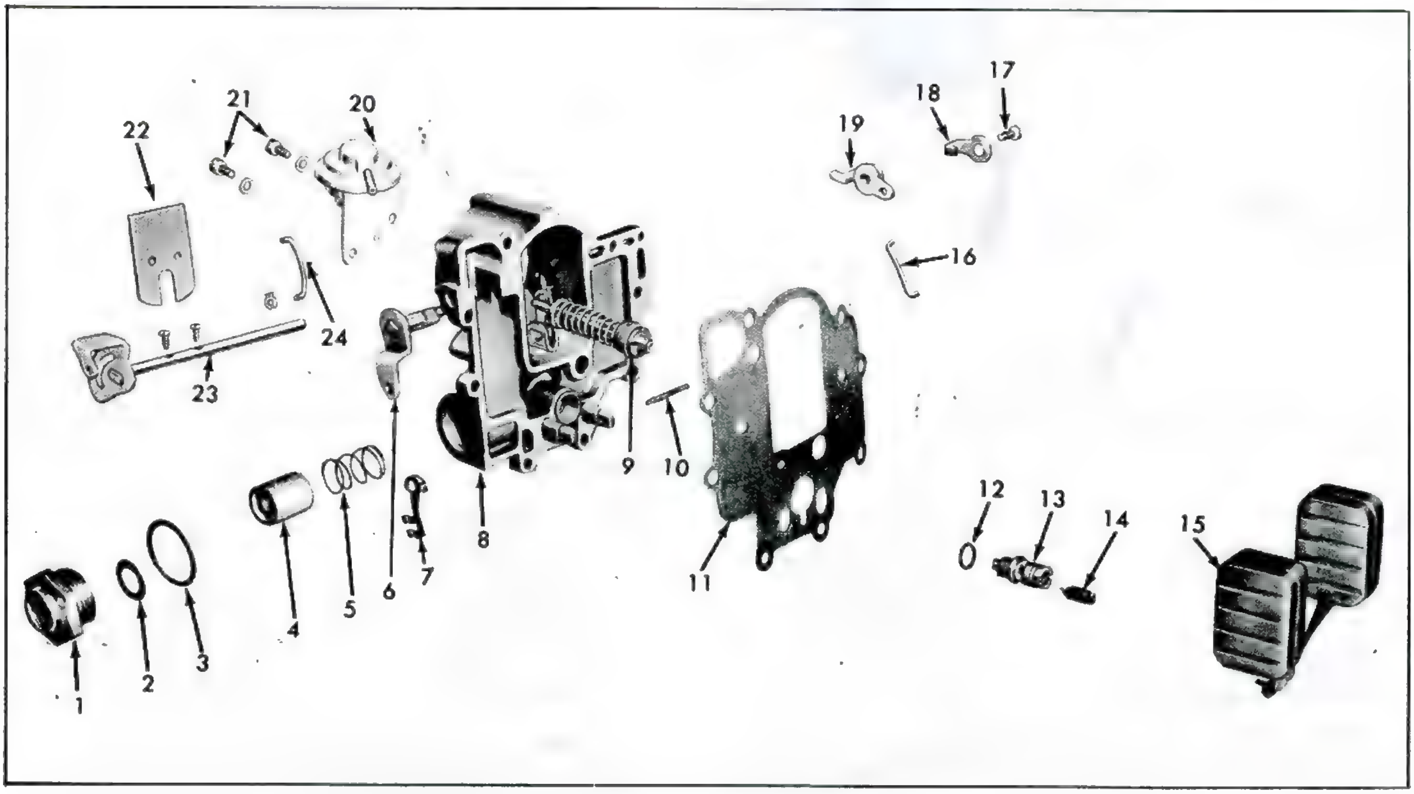


Fig. 7—Bowl Cover—Exploded View

1. Inlet Nut
2. Fuel Filter Gasket
3. Inlet Nut Gasket
4. Fuel Filter Element
5. Fuel Filter Spring
6. Accelerator Pump Lever and Shaft
7. Clip
8. Bowl Cover
9. Accelerator Pump
10. Float Pin
11. Bowl Cover Gasket
12. Needle Seat Gasket
13. Needle Seat
14. Needle
15. Float Assembly
16. Fast Idle Rod
17. Choke Shaft Lever Screw
18. Choke Shaft Outer Lever
19. Choke Shaft Kick Lever
20. Vacuum Diaphragm
21. Retainer Screws
22. Choke Valve
23. Choke Shaft and Lever Assembly
24. Diaphragm Link

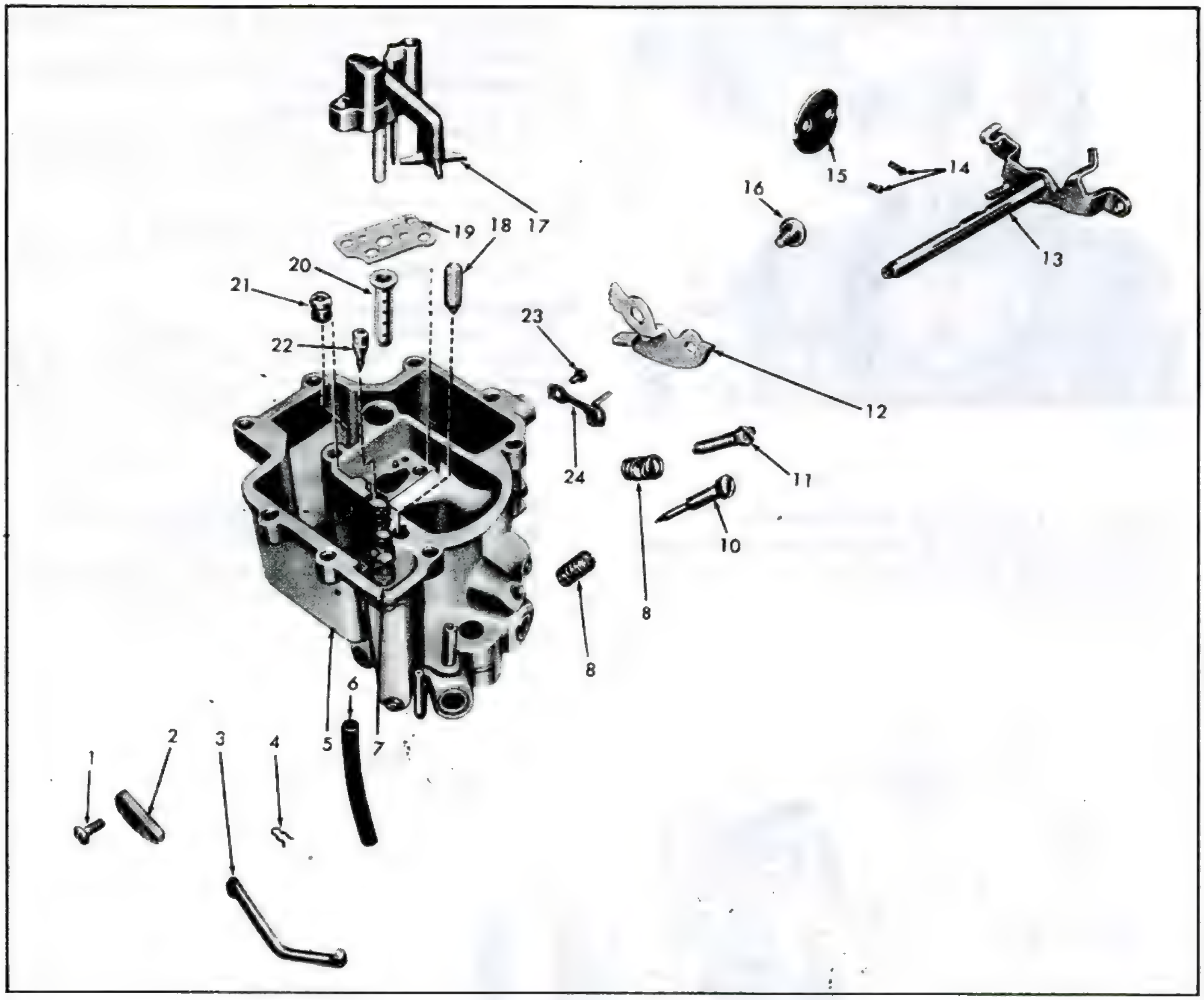


Fig. 8—Carburetor Body—Exploded View

1. Pump Lever Retaining Screw
2. Accelerator Actuating Pump Lever
3. Pump Rod
4. Clip
5. Float Bowl
6. Diaphragm Hose
7. Accelerator Pump Return Spring
8. Idle Mixture Adjusting Screw Spring
9. Curb Idle Adjusting Screw Spring
10. Idle Mixture Adjusting Screw
11. Curb Idle Adjusting Screw
12. Fast Idle Cam
13. Throttle Valve Lever and Shaft
14. Throttle Valve Retaining Screws
15. Throttle Valve
16. Fast Idle Cam Mounting Screw
17. Venturi Cluster
18. Pump Discharge Needle
19. Venturi Cluster Gasket
20. Main Well Insert
21. Main Metering Jet
22. Power Enrichment Needle
23. Vapor Vent Retaining Screw
24. Vapor Vent Valve

Make sure all jets and passages are clean. Do not use wires or drills for cleaning fuel passages or air bleeds.

3. Check all parts for wear. If wear is noted, defective parts must be replaced.

NOTE ESPECIALLY THE FOLLOWING:

A. Check float needle and seat for wear. If wear is noted the assembly must be replaced.
B. Check float hinge pin for wear and float for dents or distortion. Check floats for fuel leaks by shaking.
C. Check throttle shaft for wear and out-of-round in the throttle body section of the bowl casting.
D. Inspect idle adjusting needles for burrs or grooves and misalignment. Such a condition requires replacement.
E. Inspect pump plunger rubber; replace pump if damaged or worn.
F. Inspect pump well in fuel bowl for wear or being scored.
G. Check that main well nozzle and idle tube is not bent. Should be exactly 90° from cluster.

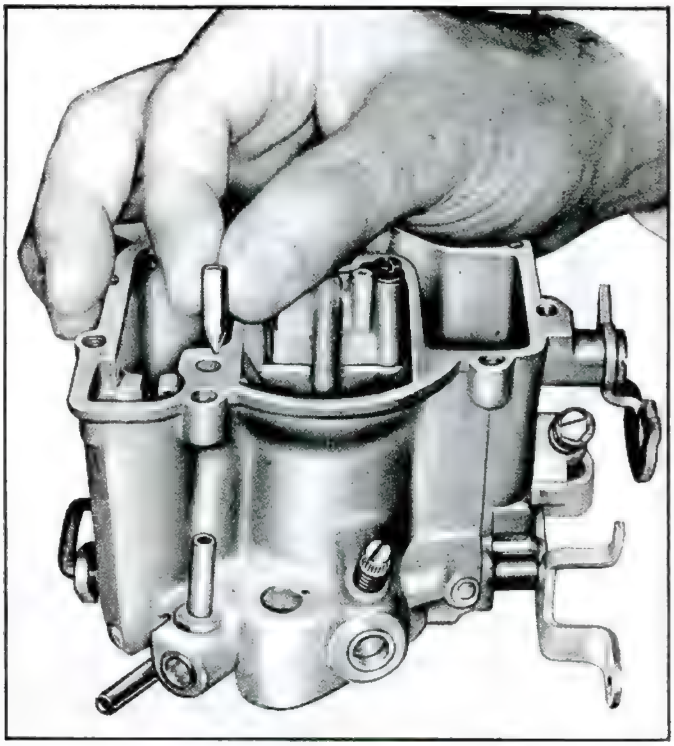


Fig. 9—Installing Pump Discharge Needle

H. Check choke shaft for wear and choke valve for nicks.
I. Inspect pump discharge needle and power enrichment needle for wear, burrs or grooves.

4. Inspect gaskets to see if they appear hard or brittle or if the edges are torn or distorted. If any such condition is noted they must be replaced.
5. Check filter element for dirt or lint. Clean and if it is distorted or remains plugged, replace.
6. If for any reason parts have become loose or damaged in the cluster casting, it must be replaced.

Assembly and Adjustments

1. Install throttle shaft and throttle valve, if removed, with two screws, carefully center and seat valve in shaft and bore.
2. Install vapor vent assembly.

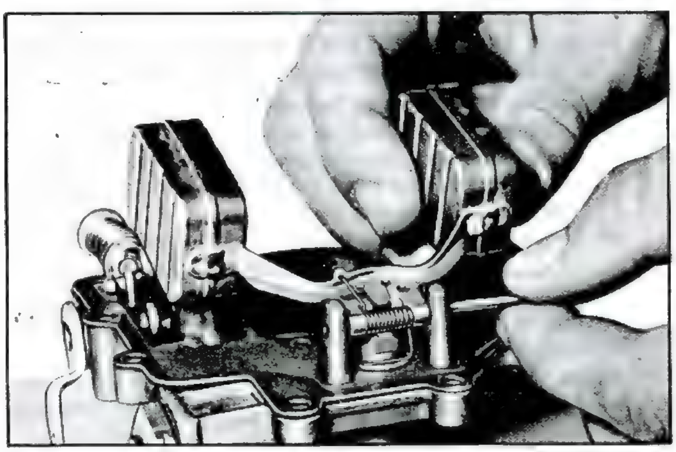


Fig. 10—Replacing Floats

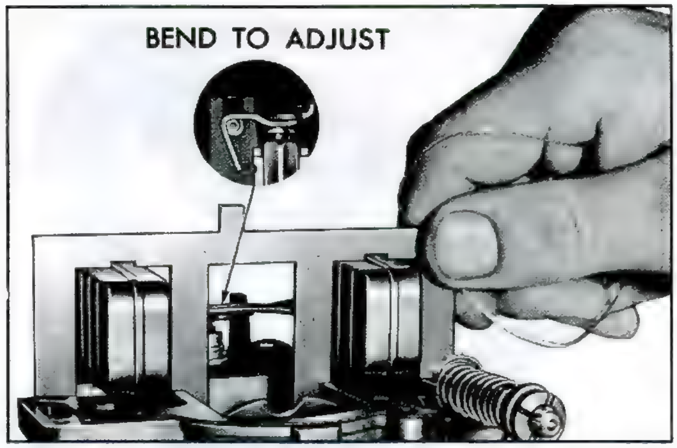


Fig. 11—Checking Float Level

3. Install power valve and main well insert, then install venturi cluster and gasket in bowl assembly, and install the two screws and lock washers.
4. If accelerator pump has been removed, replace pump assembly and install clip.

NOTE: Be sure that the pump return spring is in place in bowl assembly.

5. Install pump discharge needle (fig. 9).
6. Install choke valve, choke kick lever and outer lever cam. Retain choke valve with two screws. (Choke shaft assembly should rotate freely without binds).
7. Install float needle seat if previously removed from bowl cover.
8. Carefully replace float needle.
9. Install a new gasket and replace float and pin (fig. 10). Check float level and float drop with Tool J-21614 as follows:
10. **Check float level and float drop with Tool J-21614 as follows:**
    - Invert the cover on a flat surface. Place float level tool in Chain Gauge Set J-21614 over float (fig. 11).
    - Bend tang located just above the float needle until each float just touches the top of the gauge. Move

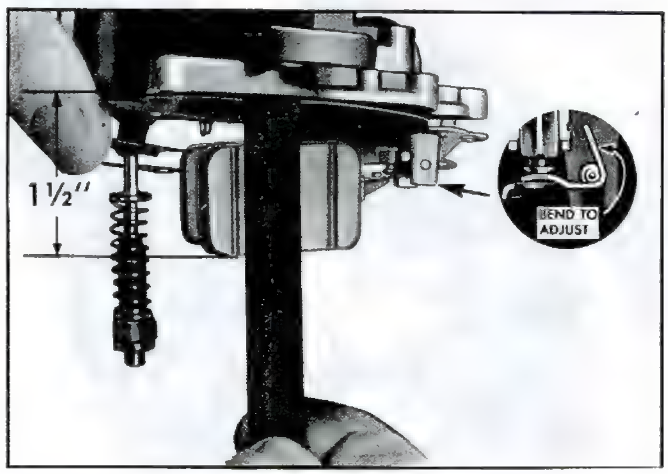


Fig. 12—Measuring Float Drop

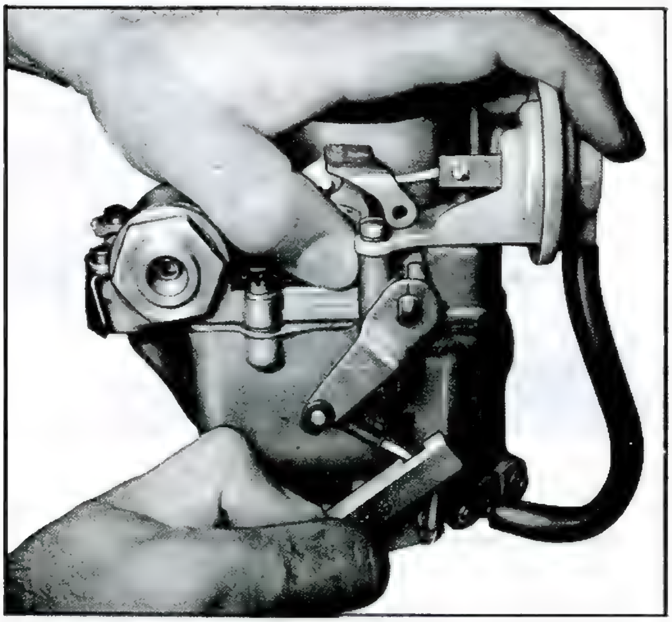


Fig. 13—Adjusting Pump Rod

gauge fore and aft to check that the floats are parallel within 1/32 to the bowl cover. Carefully bend float arms horizontally until floats are centered between the gauge legs. Tilt the assembly each way to check that the floats do not touch or rub gauge legs. Recheck float level if alignment is necessary. The float level dimension (top of float to gasket) should be 1-13/64 if measured without the gauge.

- Hold bowl cover in an upright position and measure the distance from the gasket to the bottom of the float (fig. 12). This dimension should be 1-1/2". Bend the tang at the end of the float

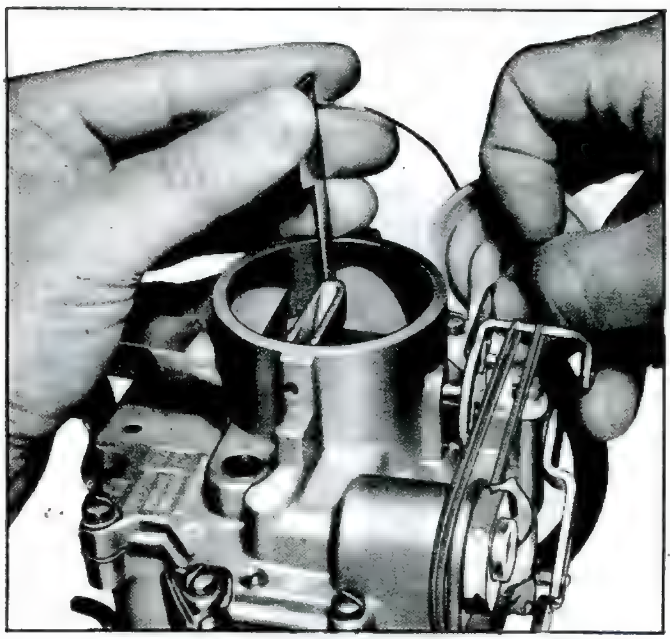


Fig. 14—Vacuum Diaphragm Adjustment

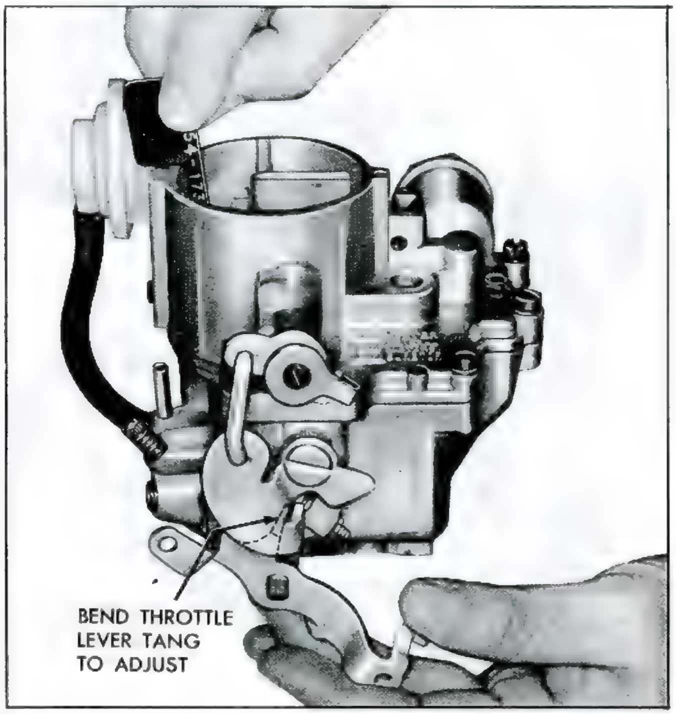


Fig. 15—Choke Unloader Adjustment

hinge arm to obtain the correct drop, recheck setting after this adjustment.

NOTE: Float gauge can be indexed at the 1-1/2" point as a permanent gauge.

11. Carefully place bowl cover assembly and new gasket on bowl assembly and install the six screws and lock washers.
12. Replace filter spring, filter gasket, gasket and inlet nut.
13. Install pump rod in pump lever and retain with clip.
14. **Adjust Pump Rod as follows (Fig. 13):**
    - Back off curb and fast idle screws until throttle valve is completely closed.
    - Holding throttle valves closed, check to see that the scribe mark on the accelerator pump lever is aligned with the raised cast tang (front edge) on the bowl cover.
    - The accelerator pump rod may be carefully bent, using a carburetor rod bending tool, such as Tool J-4552, to obtain the correct adjustment.
15. **Adjust Vacuum Break as follows:**
    - Hold vacuum break arm in against diaphragm.
    - Measure clearance between lower edge of choke valve and wall of bowl cover. Clearance should be .180"-.195" (fig. 14).
    - If necessary to adjust, bend diaphragm link.
    - At this setting, throttle lever fast idle tang should rest on second highest step of fast idle cam. If not, adjust by bending other choke shaft lever tang.
16. **Adjust Choke Unloader as follows:**
    - Check unloader adjustment by holding throttle valve in wide open position and insert a .312" wire gauge between choke valve lower edge and wall of bowl cover (fig. 15).

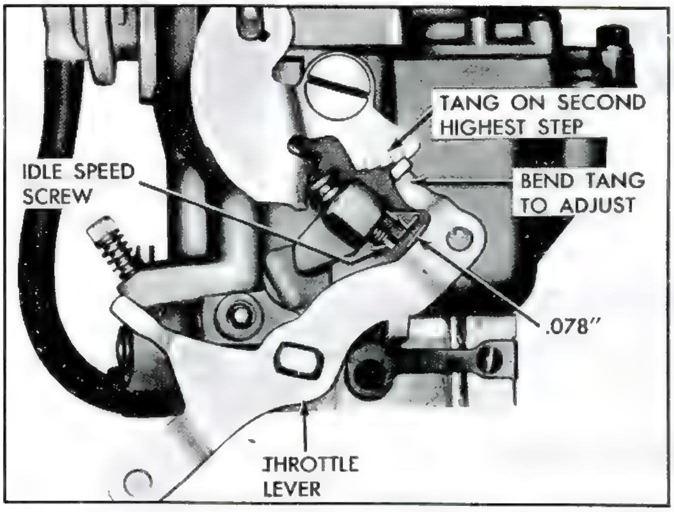


Fig. 16—Fast Idle Adjustment

- To adjust, if necessary, bend tang on throttle lever.

NOTE: Unloader adjustment should be checked especially if it has been necessary to adjust the choke shaft outer lever tang during choke diaphragm link check.

17. Adjust Fast Idle Cam as follows:
- Insert a strip of paper between idle screw and throttle lever, then holding throttle lever in the closed position with a rubber band, turn idle screw in until a firm drag is felt on the strip of paper.
- Turn idle screw in 1-1/2 additional turns.
- With throttle lever on second highest step of fast idle cam, bend tang to obtain .078" clearance between idle speed screw and throttle lever (fig. 16).

18. Adjust Vapor Vent as follows:
- The vent should just start movement when idle screw is on high step of fast idle cam. The valve will then be open at curb idling setting.

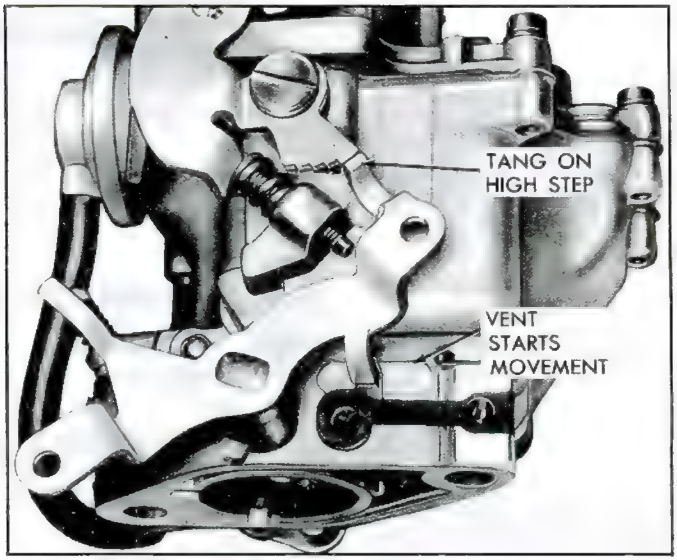


Fig. 17—Vapor Vent Adjustment

- If necessary, adjust by bending throttle lever tang (fig. 17).

Installation

1. Install insulator block in place, install carburetor on intake manifold studs. Install two attaching nuts and washers and tighten evenly. On right carburetor, install vacuum advance line with other end to distributor advance. On the left carburetor, the vacuum port tube is capped with a plastic cap.
2. Replace cross-shaft lever support and install three attaching screws at each carburetor.
3. Connect gas inlet lines.
4. Connect accelerator rod and return spring. Connect throttle rods to throttle levers.
5. Install choke control rod to each carburetor. Adjust as outlined under Section 6, Engine Tune-Up.
6. Check carburetors for Carburetor Synchronization as outlined in Section 6, Engine Tune-Up.
7. Replace air cleaner assembly.

ROCHESTER H

INDEX

GENERAL DESCRIPTION

The Rochester H Carburetor (fig. 18) used as a secondary carburetor on the Corvair 10700 series (4 x 1 carburetors) (fig. 19) has no choke, idle, power enrichment or low speed circuits.

SERVICE PROCEDURES

For Carburetor Synchronization, refer to Section 6, Engine Tune-Up (Corvair 10700 series).

Additional Checks and Adjustments

The following checks and adjustments may be made without removing the carburetor from the vehicle.

- Float Adjustments
- Pump Rod Adjustment

REPAIR PROCEDURES

Removal

1. Disconnect carburetor rods at carburetor throttle levers.
2. Remove linkage bracket retaining screws and swing bracket and linkage up for clearance.
3. Remove two nuts and washers attaching carburetor to intake manifold studs, then remove carburetor.

Disassembly

1. Remove clip attaching pump rod to pump lever and disconnect rod from lever.

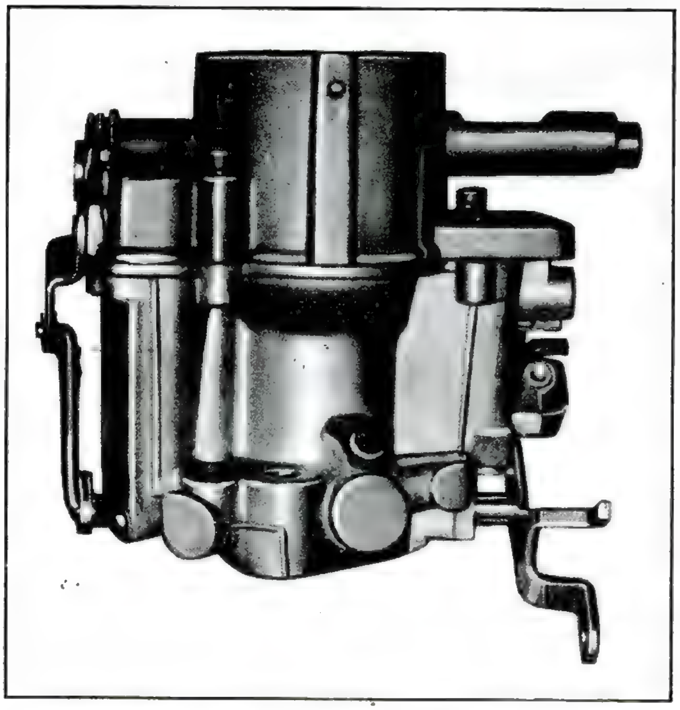


Fig. 18—Rochester H Carburetor

2. Remove fuel inlet nut and gasket and remove filter element and spring.
3. Remove bowl cover attaching screws then remove cover assembly.
4. Remove pin attaching floats to bowl cover assembly and check floats for damage.
5. Lift out float needle. Check seat for dirt or corrosion.
6. If necessary, needle seat and gasket may be removed by using a large size screw driver. It may then be cleaned or replaced as needed.
7. Accelerator pump may be removed if necessary. Remove clip and pump. Remove shaft and lever, if desired, by removing clip, shaft and lever.
8. Remove the two screws and lock washers attaching venturi cluster to the bowl assembly and lift out the cluster, gasket and main well insert.
9. Remove pump discharge needle valve.
10. If necessary, invert carburetor bowl and remove throttle valve retaining screws and remove throttle valve and shaft assembly.

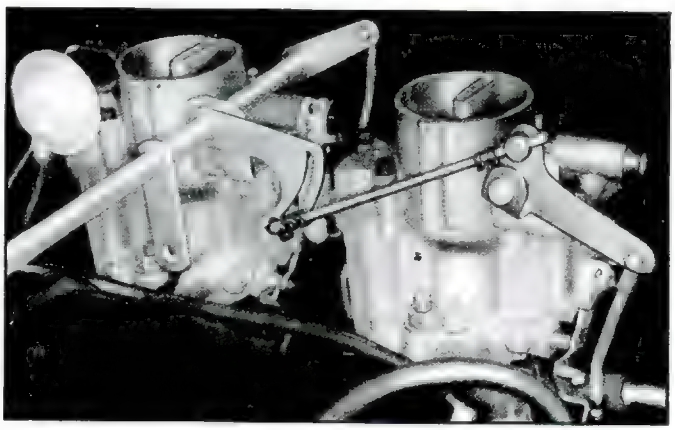


Fig. 19—Rochester H Carburetor Installed

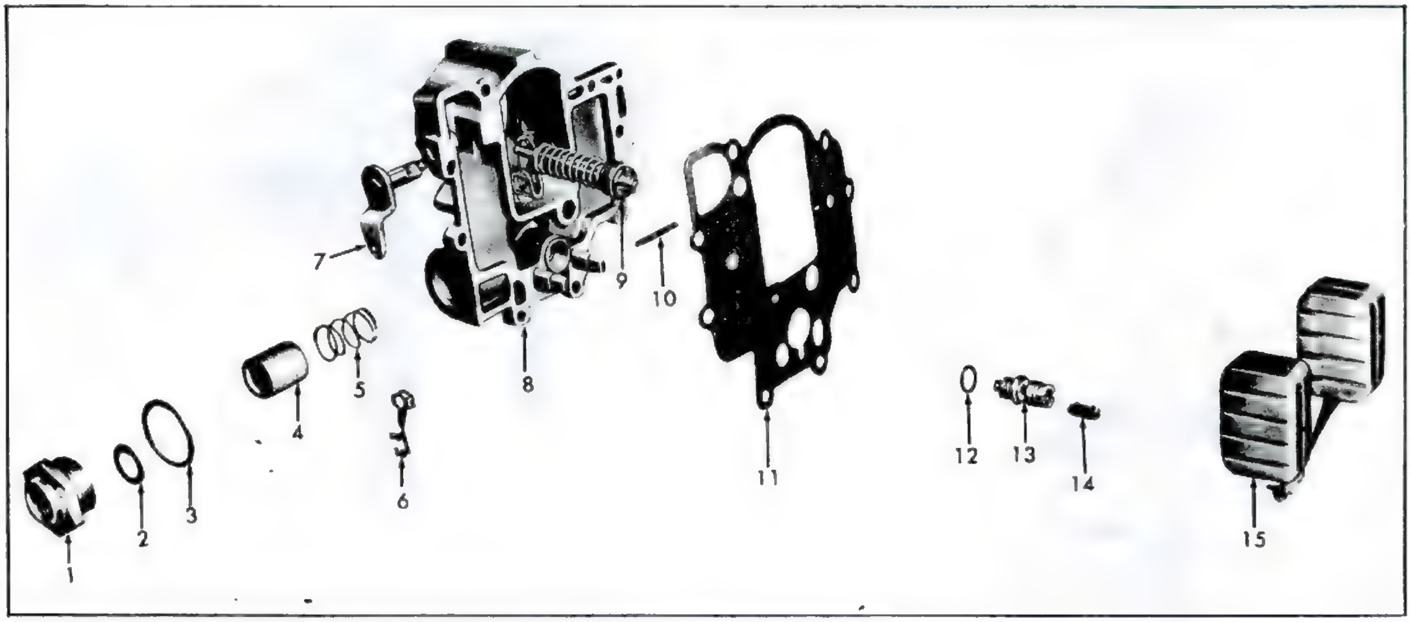


Fig. 20—Bowl Cover—Exploded View

1. Inlet Nut
2. Fuel Filter Gasket
3. Inlet Nut Gasket
4. Fuel Filter Element
5. Fuel Filter Spring
6. Clip
7. Accelerator Pump Lever and Shaft
8. Bowl Cover
9. Accelerator Pump
10. Float Pin
11. Bowl Cover Gasket
12. Needle Seat Gasket
13. Needle Seat
14. Needle
15. Float Assembly

Cleaning and Inspection

Dirt, gum, water or carbon contamination in the carburetor or on the exterior moving parts are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Thoroughly clean carburetor castings and metal parts in clean cleaning solvent.

   CAUTION: Pump plunger and gaskets should never be immersed in carburetor cleaner.

2. Blow out all passages in castings, dry with compressed air and blow out all parts until they are dry. Make sure all jets and passages are clean. Do not use wires or drills for cleaning fuel passages or air bleeds.
3. Check all parts for wear. If wear is noted, defective parts must be replaced.

   NOTE ESPECIALLY THE FOLLOWING:

   A. Check float needle and seat for wear. If wear is noted the assembly must be replaced.
   B. Check float hinge pin for wear and float for dents or distortion. Check floats for fuel leaks by shaking.
   C. Check throttle shaft for wear and out-of-round in the throttle body section of the bowl casting.
   D. Inspect pump discharge needles for burrs or grooves. Such a condition requires replacement.
   E. Inspect pump plunger rubber; replace pump if damaged or worn.
   F. Inspect pump well in fuel bowl for wear or being scored.
   G. Check that main well nozzle is not bent. Should be exactly 90° from cluster.

4. Inspect gaskets to see if they appear hard or brittle or if the edges are torn or distorted. If any such condition is noted they must be replaced.
5. Check filter element for dirt or lint. Clean and if it is distorted or remains plugged, replace.
6. If for any reason parts have become loose or damaged in the cluster casting, it must be replaced.

Assembly and Adjustments

1. Install throttle shaft and throttle valve, if removed, with two screws, carefully center and seat valve in shaft and bore.
2. Install main well insert, then install venturi cluster and gasket in bowl assembly and install the two screws and lock washers.
3. If accelerator pump has been removed, replace pump assembly and install clip.

   NOTE: Be sure that the pump return spring is in place in bowl assembly.

4. Install pump discharge needle.
5. Install float needle seat if previously removed from bowl cover.
6. Carefully replace float needle.
7. Install a new gasket and replace float and pin.
8. **Check float level and float drop with Tool J-21614 as follows:**
   - Invert the cover on a flat surface. Place float level tool in Chain Gauge Set J-21614 over float (fig. 22).
   - Bend tang located just above the float needle until each float just touches the top of the gauge. Move gauge fore and aft to check that the floats are parallel within 1/32 to the bowl cover. Carefully

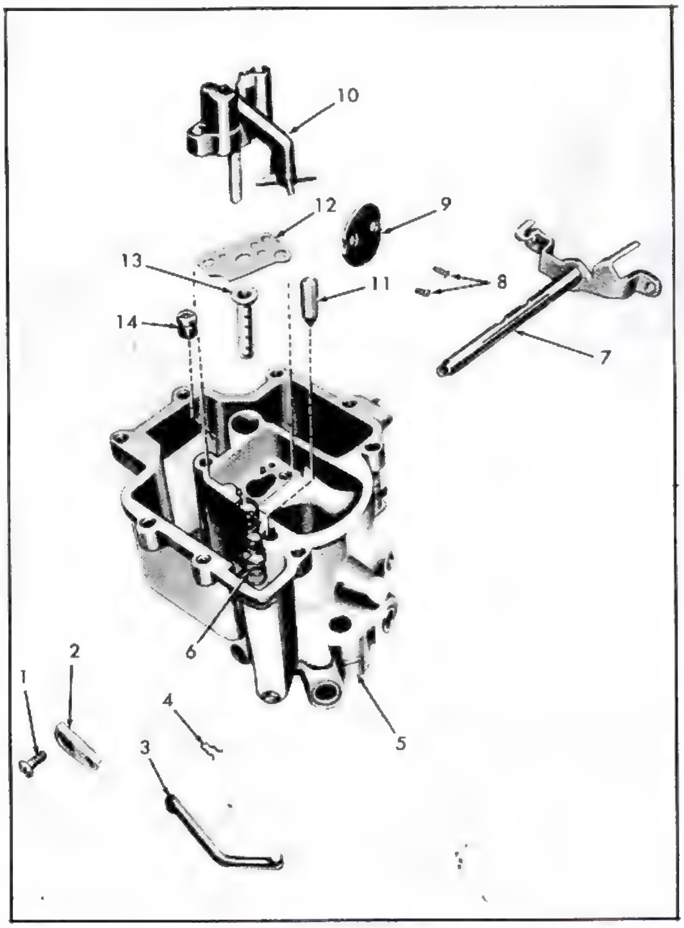


Fig. 21—Carburetor Body—Exploded View

1. Pump Lever Retaining Screw
2. Accelerator Actuating Pump Lever
3. Pump Rod
4. Clip
5. Float Bowl
6. Accelerator Pump Return Spring
7. Throttle Valve Lever and Shaft
8. Throttle Valve Retaining Screws
9. Throttle Valve
10. Venturi Cluster
11. Pump Discharge Needle
12. Venturi Cluster Gasket
13. Main Well Insert
14. Main Metering Jet

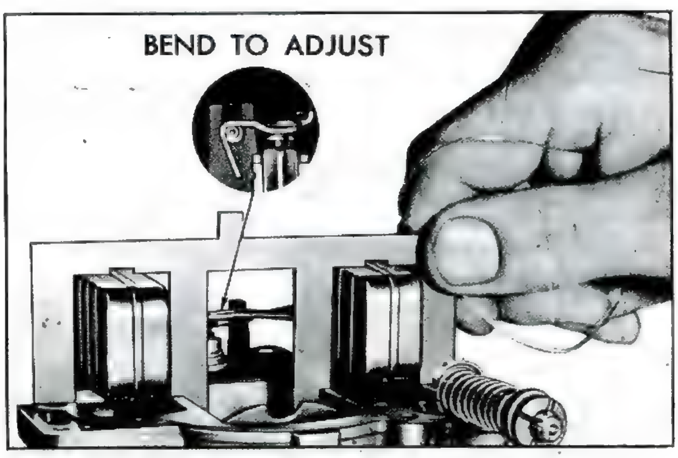


Fig. 22—Checking Float Level

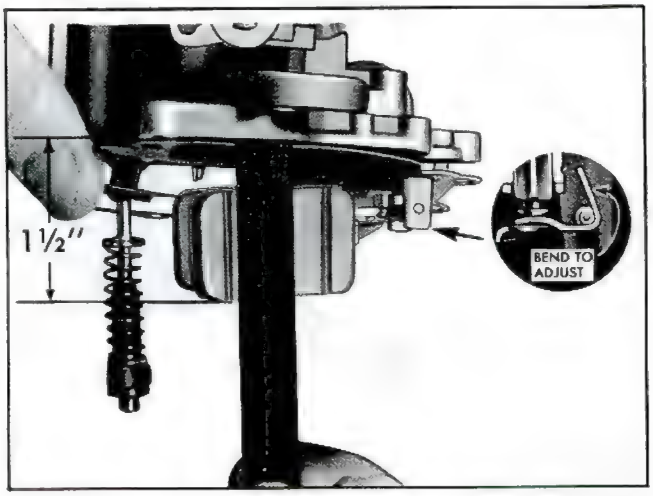


Fig. 23—Measuring Float Drop

bend float arms horizontally until floats are centered between the gauge legs. Tilt the assembly each way to check that the floats do not touch or rub gauge legs. Recheck float level if alignment is necessary. The float level dimension (top of float to gasket) should be 1-13/64 if measured without the gauge.

- Hold bowl cover in an upright position and measure the distance from the gasket to the bottom of the float (fig. 23). This dimension should be 1-1/2". Bend the tang at the end of the float hinge arm to obtain the correct drop, recheck setting after this adjustment.

NOTE: Float gauge can be indexed at the 1-1/2" point as a permanent gauge.

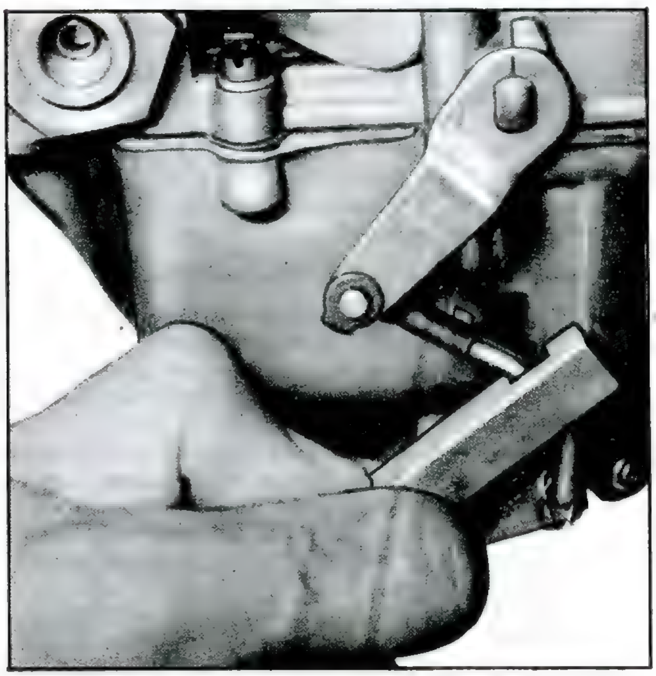


Fig. 24—Adjusting Pump Rod

9. Carefully place bowl cover assembly and new gasket on bowl assembly and install the six screws and lock washers.
10. Replace filter spring, filter gasket, gasket and inlet nut.
11. Install pump rod in pump lever and retain with clip.
12. **Adjust Pump Rod as follows (Fig. 24):**
    - Holding throttle valves closed, check to see that the scribe mark on the accelerator pump lever is aligned with the raised cast tang (front edge) on the bowl cover.
    - The accelerator pump rod may be carefully bent, using a carburetor rod bending tool, such as Tool J-4552, to obtain the correct adjustment.

Installation

1. Install insulator block in place, install carburetor on on intake manifold studs.
2. Install two attaching nuts and washers and tighten evenly.
3. Swing linkage bracket down and install attaching screws.
4. Connect gas inlet line.
5. Connect carburetor rod at carburetor throttle lever.
6. Check carburetors for Carburetor Synchronization as outlined in Section 6, Engine Tune-Up (Corvair 10700 series).

CARTER YH

INDEX

GENERAL DESCRIPTION

This section covers the Carter YH Carburetor, used in conjunction with the Turbocharger, as optional equipment (fig. 25).

SERVICE PROCEDURES

For Accelerator Linkage Adjustment, Idle Speed and Mixture Adjustment and Choke Adjustment refer to Section 6, Engine Tune-Up (Turbocharger Option).

Additional Checks and Adjustments

The following checks and adjustments may be made without removing the carburetor from the vehicle. Refer to Repair Procedures, Assembly and Adjustments.

- Metering Rod Adjustment
- Float Adjustments
- Fast Idle Adjustment
- Choke Unloader Adjustment
- Choke Adjustment

Fuel Filter Replacement

The fuel filter is a separate unit mounted on the air cleaner support bracket at the left of the air cleaner. It should be replaced as recommended in Section 0.

Replacement consists of disconnecting the inlet, outlet and bypass fuel lines, loosening clamp screw and removing filter unit. Reverse to install new unit. (Arrows show flow direction.)

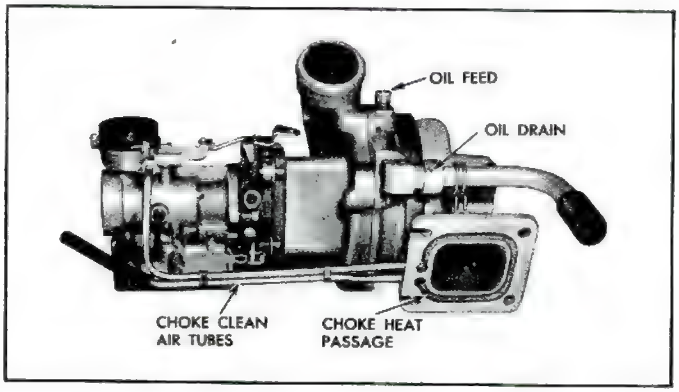


Fig. 25—Carter YH Carburetor

REPAIR PROCEDURES

Removal

With Turbocharger as an Assembly

This method is outlined under Turbocharger—Removal. When this method is used, caution is necessary to prevent damage to turbine wheel, during disassembly of carburetor from Turbocharger.

Separately from Turbocharger

1. Remove air cleaner.
2. Disconnect choke heat tube, fuel line and accelerator linkage at carburetor.
3. Remove carburetor mounting nuts and remove carburetor from vehicle.

NOTE: It will be necessary to use a short or curved open-end wrench to remove the front nut.

Disassembly

1. Remove inlet filter screen nut and screen.
2. Remove six screws and float bowl cover (fig. 26).
3. Remove float hinge pin, float and float needle and seat.
4. Remove float bowl cover gasket, tip carburetor and remove pump discharge needle.
5. Loosen pump lever screw from throttle shaft and slide lever off shaft and link.
6. Depress small spring on pump with a screw driver and remove spring seat and spring.

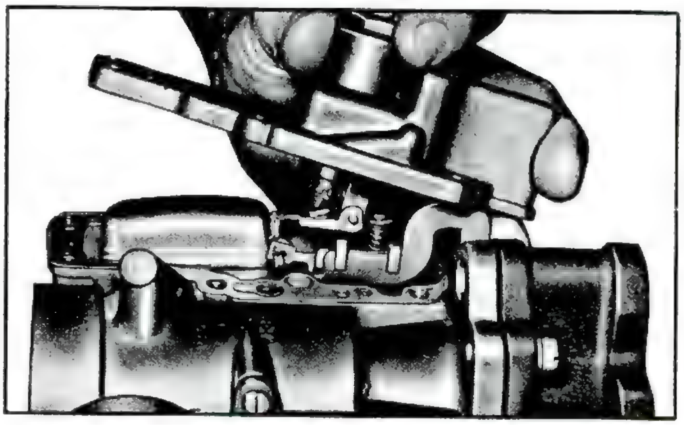


Fig. 26—Removing Bowl Cover

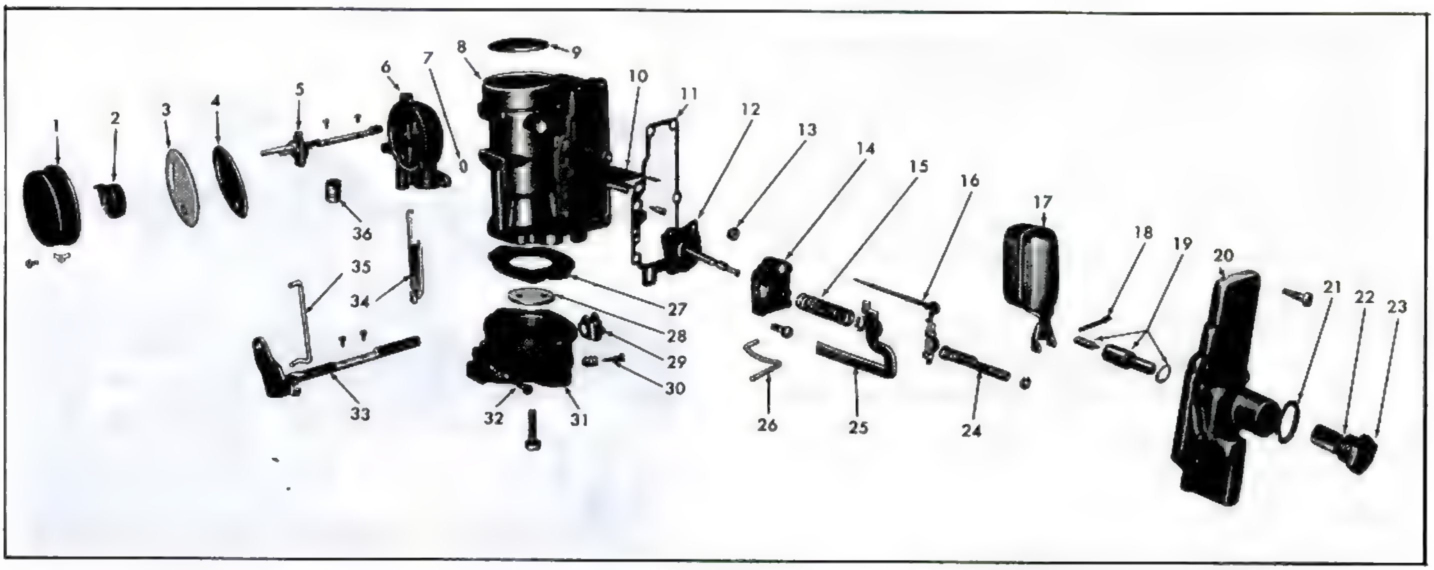


Fig. 27—Carburetor—Exploded View

1. Choke Coil Housing
2. Choke Coil
3. Gasket
4. Baffle Plate
5. Choke Shaft
6. Choke Housing
7. Vacuum Passage "O" Ring Seal
8. Carburetor Body
9. Choke Plate
10. Bowl Splash Baffle
11. Bowl Cover Gasket
12. Diaphragm Pump Assembly
13. Main Jet
14. Pump Housing
15. Pump Lower Spring
16. Metering Rod and Arm Assembly
17. Float
18. Hinge Pin
19. Needle and Seat Assembly
20. Bowl Cover
21. Gasket
22. Inlet Screen
23. Screen Nut
24. Upper Pump Spring
25. Pump Actuating Link
26. Connector Link
27. Gasket
28. Throttle Plate
29. Throttle Lever Pump Arm
30. Idle Mixture Screw
31. Throttle Body
32. Idle Speed (Air) Screw
33. Throttle Shaft
34. Fast Idle Link
35. Fast Idle Connector Link
36. Choke Piston

7. Lift metering rod arm and metering rod from pump rod and metering jet.
8. Raise pump arm enough to remove the link, then remove pump arm.
9. Remove 4 screws and remove diaphragm pump assembly.
10. Remove fuel splash deflector plate and metering jet.
11. Remove choke link clip and choke link.
12. Remove choke housing cover screws, cover, gasket and baffle plate, then slide choke lever out of housing.
13. Remove three throttle flange-to-carburetor body screws and remove flange and gasket from body section.
14. Remove idle speed screw and spring from flange. For normal cleaning and inspection, the carburetor is disassembled as far as is necessary. The choke valve, choke piston or throttle valve should be removed only if valve is damaged or shaft and piston are binding. If either condition exists, complete the disassembly as follows:
15. File staked ends of throttle plate screws, level with throttle shaft (to avoid damaging throttle shaft threads), then remove the screws and throttle valve and slide shaft from flange.
16. File staked ends of choke valve screws, level with choke shaft, then remove screws and choke plate.
17. Remove choke shaft and choke piston by rotating the shaft until the piston comes out of the bore, then slide shaft assembly from carburetor.
18. Remove three choke housing screws, remove housing and discard vacuum passage "O" ring seal.

Cleaning and Inspection

The most frequent causes of carburetor malfunction are gum, dirt, carbon and water. Carefully clean and inspect all parts and castings during carburetor overhaul.

1. Wash all parts, except choke coil housing and pump, in carburetor cleaning solution.
2. Choke coil housing should be cleaned in gasoline.
3. Inspect links and operating lever holes for wear.
4. Inspect throttle and choke plates for gouges or other damage and their shafts for binding or excessive wear.
5. Inspect float for dents or leaks.

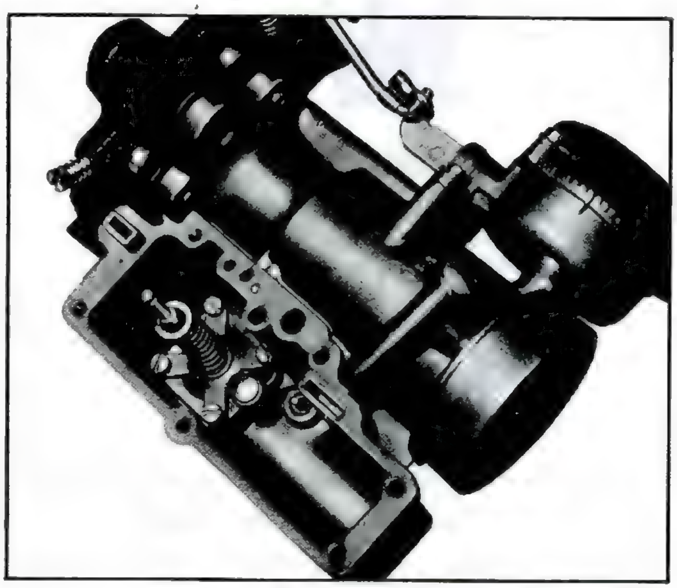


Fig. 28—Pump Diaphragm and Metering Jet Installation

6. Inspect choke piston for free operation in its cylinder. Remove welch plug from cylinder only if piston sticks and it is necessary to clean the cylinder. Clean the cylinder with fine sandpaper if necessary.
7. Inspect float needle and seat for burrs or ridges. If present, replace both the needle and seat; never replace separately or try to file burrs or ridges.
8. Inspect metering rod and jet. Replace if bent, burred or distorted.
9. Inspect all mating surfaces of castings and flanges for burrs, gouges or surface irregularities. Use a square edge to check throttle flange for warpage. All surfaces must be smooth and square to prevent leaks.
10. Inspect accelerator pump diaphragm for damage. Replace diaphragm and rod assembly if necessary.

Assembly and Adustments

1. If throttle shaft was removed:
    a. Slide shaft in throttle flange.
    b. Position throttle plate on flat of shaft with numbered side to shaft, then install new screws loosely.
    c. Center throttle plate on shaft and in the bore and tighten the screws. Peen the screws securely.
2. If choke shaft was removed:
    a. Use a new vacuum passage "O" ring seal, position the choke housing on air horn and install three attaching screws just snug.
    b. Slide choke shaft into air horn part way, then install piston to shaft and position the shaft by

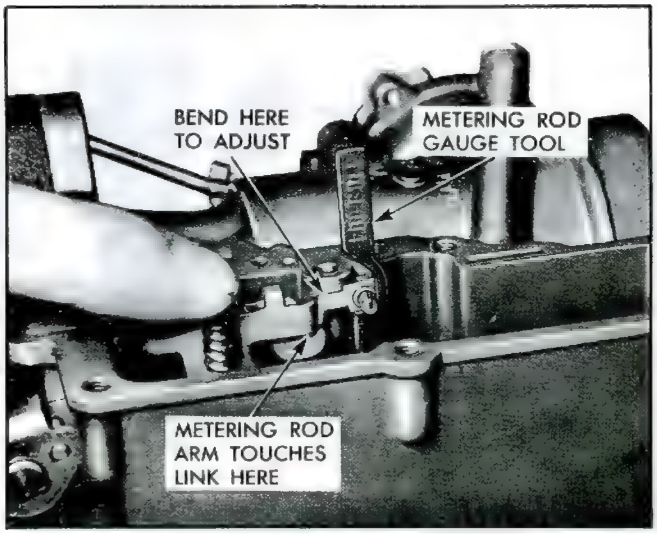


Fig. 30—Adjust Metering Rod Arm

rotating while installing piston into its cylinder.
    c. Tighten choke housing attaching screws.
    d. Position choke plate on flat of shaft with identification numbers on air cleaner side.
    e. Install new choke plate attaching screws loosely, center the plate on shaft and in bore and tighten the screws. Peen the screws securely (using pliers).
3. Install throttle flange gasket and flange onto carburetor body with three retaining screws.
4. Install pump diaphragm assembly in diaphragm housing, then install diaphragm spring (lower) and spring retainer.
5. Install metering rod jet (no gasket with this jet).
6. Install diaphragm housing screws in housing and thread them 2 or 3 threads into diaphragm (to hold diaphragm in alignment), then install the assembly in carburetor bowl and tighten screws (fig. 28).
7. Install splash shield between metering rod jet and pump housing.
8. Install metering rod onto the metering rod arm, hook the spring and install retainer clip (fig. 29).
9. Install pump and metering rod linkage as follows: (Refer to fig.)
    a. Pump lifter link in guide opening, insert throttle

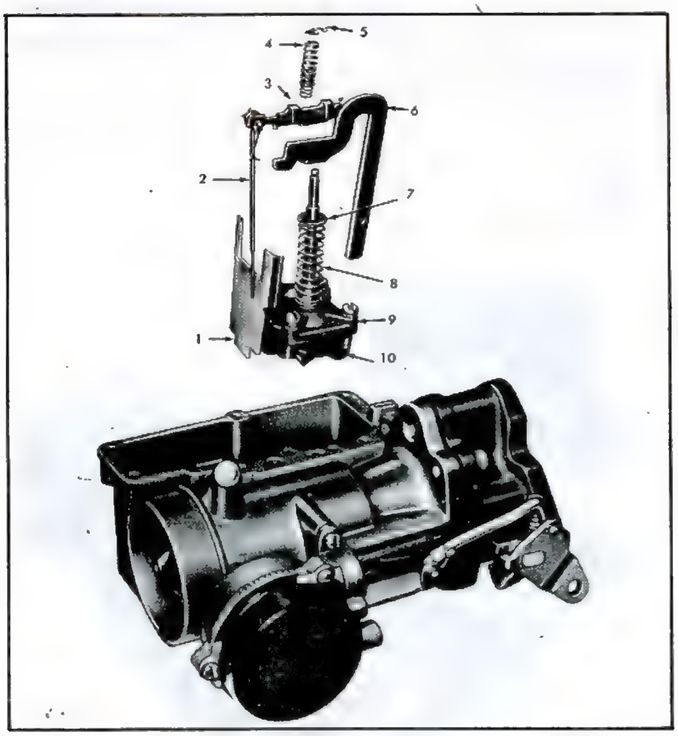


Fig. 29—Pump and Metering Rod Assembly

1. Shield, Splash
2. Metering Rod
3. Metering Rod Arm
4. Upper Springs
5. Upper Springs Seat
6. Pump Link
7. Lower Spring Seat
8. Lower Spring
9. Pump Housing
10. Diaphragm Assembly

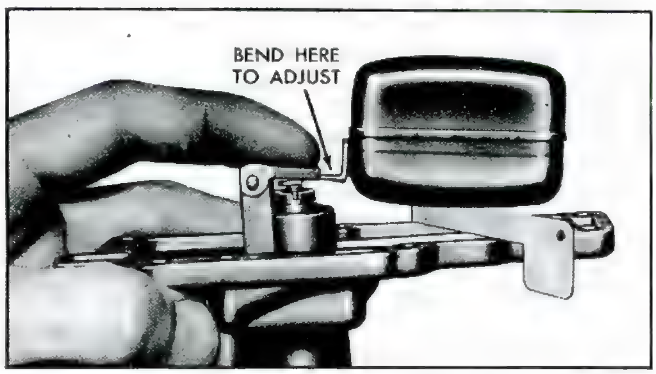


Fig. 31—Adjusting Float Level

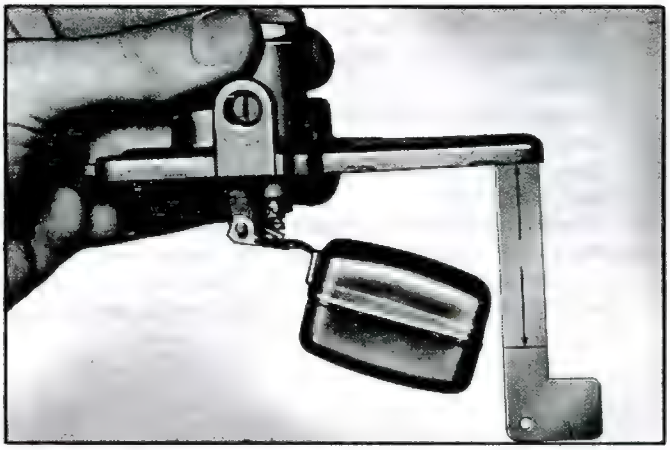


Fig. 32—Measuring Float Drop

lever connector link onto pump lifter link (connector must be installed before lifter link is completely in position) then place lifter arm down over pump rod.

b. Metering rod in jet and arm over pump rod and lifter arm.
c. Upper spring over pump rod, compress with screw driver and install retainer.
d. Install throttle shaft pump lever over throttle shaft and pump link, then tighten retaining screw.

10. **Adjust metering rod as follows:**
    a. Hold throttle valve tightly closed.
    b. Remove metering rod from carburetor and place Gauge Tool J-21056 in metering jet (fig.).
    c. Push down on pump diaphragm rod until the metering rod arm just touches the lifter link (fig. 30).
    d. With the gauge (Tool J-21056) in the jet, the metering rod arm pin should just contact the top surface of gauge tool.

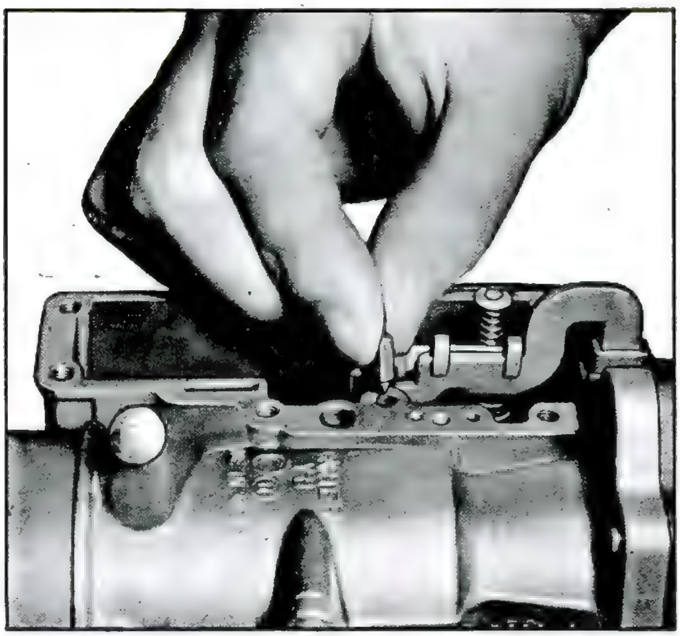


Fig. 33—Install Pump Discharge Needle

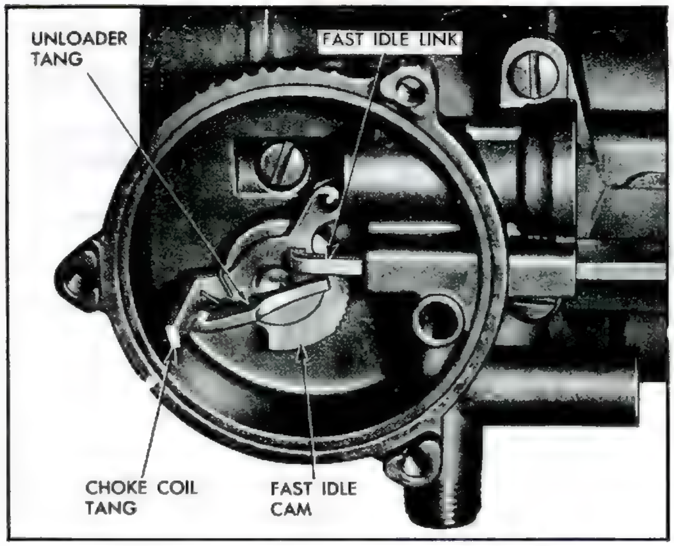


Fig. 34—Choke Housing and Fast Idle Linkage

    e. If necessary, adjust by bending metering rod arm at point shown.

11. Install new float needle valve seat and needle valve in bowl cover, then install float and float hinge pin with the hinge pin shoulder to outboard side of carburetor bowl.
12. **Adjust Float as follows:**
    - Invert cover and measure the distance between cover gasket surface and float at center of float (fig. 31). This FLOAT LEVEL dimension should be 5/8" or use Tool J-21056.
    - Adjust, if necessary, by bending float arm.
    - Invert cover to upright position allowing float to hang down.
    - Measure the distance between cover gasket surface and seam of float at free end (fig. 32). This FLOAT DROP dimension should be 2-3/8" ± 1/16".
    - Adjust by bending the tang at hinge end.
13. Install pump discharge needle (fig. 33) then install a new cover gasket on bowl and install bowl cover and six screws.
14. Install fast idle link into choke housing and hook unloader projection over tang on fast idle cam assembly (fig. 34).
15. Install choke link connector link to throttle lever keyed hole then to choke link with clip.
16. **Adjust fast idle as follows:**
    a. Hold choke valve tightly closed and close throttle valve as far as it will go. (This places fast idle link on high step of cam.)
    b. Hold the throttle valve in this position, a .030" gauge (Tool J-21056) should just go between throttle valve and bore at side opposite idle port.
    c. If necessary, adjust by bending fast idle connector link at curvature.

NOTE: Always perform fast idle adjustment before unloader adjustment.

17. **Check unloader adjustment as follows:**
    a. Open throttle to wide open position while holding tension in opposite direction on choke valve.
    b. Measure the distance between choke valve edge

and bore opposite the vent tube side. This unloader measurement should be 7/16".

c. If necessary, adjust by bending unloader tang on fast idle cam.

18. Install choke baffle plate, gasket, choke coil housing, housing retainer clips and screws onto choke housing with screws just snug.
19. **Adjust coil housing to specifications, then tighten housing retainer screws.**

Installation

1. Install carburetor over mounting studs on Turbocharger; install lower front nut and washer first, then install the other two nuts and washers and tighten.
2. Connect choke heat tube and fuel line at carburetor.
3. Install air cleaner and connect clean air tube at air cleaner (be sure air cleaner to carburetor "O" ring seal is in place).
4. Connect accelerator linkage at carburetor.
5. Start the engine and adjust idle speed and mixture and throttle return check valve clearance as outlined in Section 6, Engine Tune-Up (Turbocharger Option).

TURBOCHARGER

INDEX

GENERAL DESCRIPTION

The Turbocharger for the Corvair engine is a device to improve engine breathing, thereby increasing horsepower output. The Turbocharger consists of a precision balanced rotating group, enclosed in a contoured housing, with a turbine wheel at one end and a centrifugal impeller at the other. The name Turbocharger is used because the impeller is turbine driven, rather than mechanical as in a supercharger.

Hot exhaust gases are directed against the turbine blades, spinning the turbine, shaft and impeller at a high rate of speed. The impeller, in the Turbocharger housing, draws air-fuel mixture from the carburetor and passes it to the intake manifold at a higher-than-atmospheric pressure. This increases the amount of air-fuel mixture available to the cylinders and results in a greater horsepower output.

As a result of the increase in volume and temperature of the exhaust gases when the engine is under heavy load, the Turbocharger speed automatically increases. This provides more air-fuel mixture, to meet the engine demand (fig. 35).

The Turbocharger turbine and impeller shaft rotates on a semi-floating sleeve bearing. The bearing is lubricated with engine oil, under pressure, from the oil filter adapter. The oil is drained through a large tube into the rocker arm area of the right cylinder head.

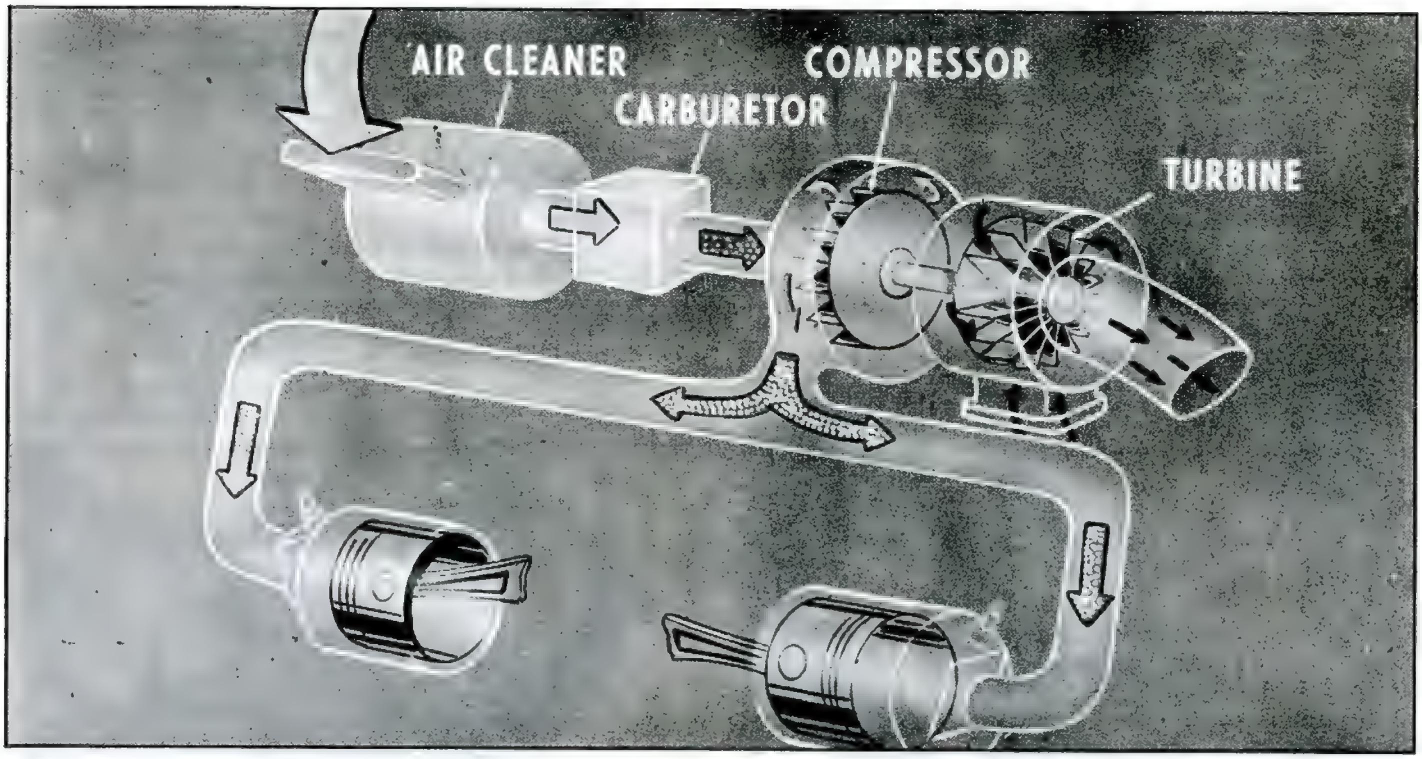


Fig. 35—Turbocharger Operational Schematic

MAINTENANCE

Periodic Inspection

Whenever routine service of the engine is performed, inspect the Turbocharger as follows:

1. Inspect the hoses and connections of the air intake system between the carburetor and the Turbocharger and from Turbocharger to intake manifold for leakage due to cracks, damaged gaskets, loose clamps or connections and for restriction due to collapsed hoses or dented tubing.
2. Inspect for exhaust leakage due to cracked exhaust

manifold, loose Turbocharger mountings or damaged gaskets.
3. Inspect oil lines and fittings for kinks, damage or leakage.
4. Observe engine exhaust. Excessive smoke may indicate a restricted air cleaner, overrich mixtures or faulty Turbocharger (seal) operation.
5. Note unusual noises or vibration that would warrant further inspection of Turbocharger.

Major Inspection

Every 50,000 miles, or if trouble is suspected in Turbocharger, it should be inspected and serviced as follows:

1. Disconnect oil drain line at Turbocharger elbow. Connect a hose from the elbow to a container placed at side of engine, then start engine and run at idle speed for one minute to determine oil flow (should be approximately 1 quart per minute at idle).
2. Remove Turbocharger and carburetor assembly from the engine.
3. Remove carburetor from Turbocharger assembly.
4. Inspect the turbine wheel for:
   a. Cracks, erosion: chipped, nicked, missing or bent blades.
   b. Carbon build-up on blades.
   c. Carbon accumulation on back face of turbine wheel.
   d. Free rotation by depressing the shield against the spring ring, then rotating the wheel. If the turbine wheel does not rotate freely, disassemble the unit and inspect for damaged parts or foreign material causing the interference.
5. Remove six retaining bolts (fig. 36) and remove compressor housing and gasket.
6. Inspect compressor housing for scoring, wiping, erosion or pit marks on the inner contour.
7. Inspect impeller wheel for damaged blades or evidence of rubbing in the housing.

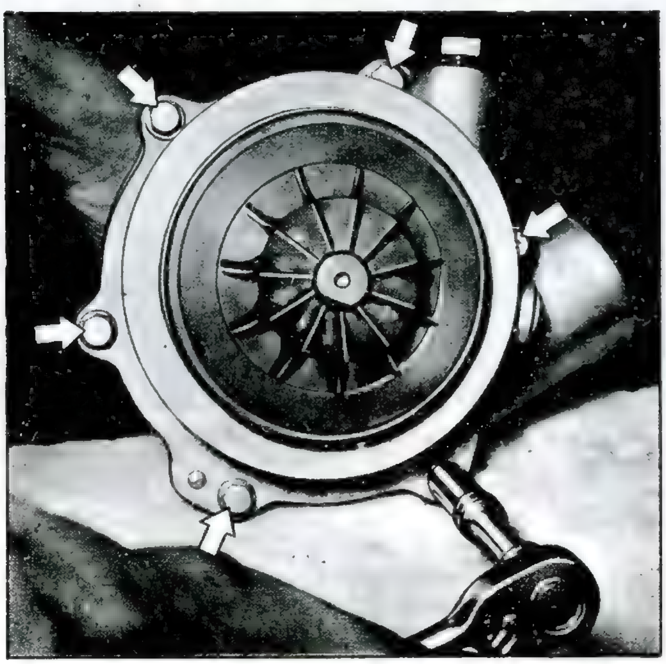


Fig. 36—Compressor Housing Retaining Bolts

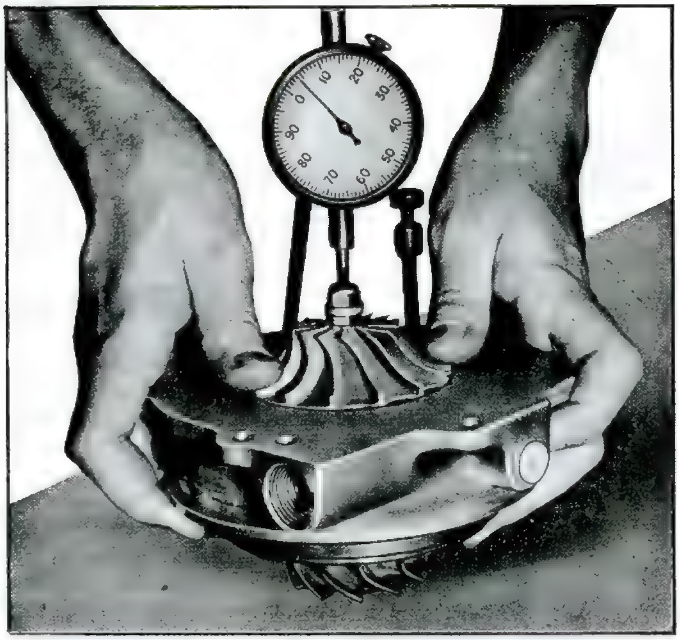


Fig. 37—Gauging Turbine Shaft End Play

8. Note any oil accumulations in housing or on impeller indicating a defective oil seal.
9. If the impeller requires cleaning, use a nylon bristle brush and a solvent such as Diesel fuel or kerosene to remove accumulated dirt. Thoroughly clean the impeller and compressor housing.

NOTE: Failure to remove all dirt may result in a more severe unbalance than existed prior to cleaning.

10. Measure turbine shaft end play as follows:
    a. Attach a dial indicator to the bearing housing so that indicator point is resting on the impeller nut (fig. 37).
    b. Rest assembly squarely on hub of turbine wheel, then push down on housing and record the indicator reading. Release pressure on the housing

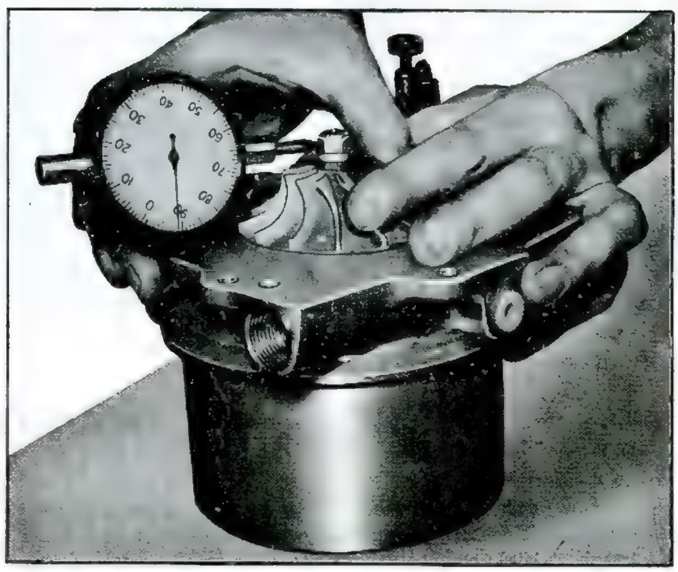


Fig. 38—Gauging Turbine Shaft Radial Play

and then repeat the operation at least once to check measurement. (The shield spring ring acts to return the wheel and shaft opposite the pressure on housing; it is not necessary to hold the shield away from the turbine wheel.)

c. Allowable end play is .005" to .008". If end play is excessive, the Turbocharger should be rebuilt.

11. Measure turbine shaft radial play as follows:
    a. With the assembly on the support ring (Tool J-21004), position the dial indicator so its point is resting on a flat of the impeller nut (fig. 38) and needle set at zero.
    b. Push the impeller from side to side against indicator point and record readings, then repeat at least once to check your reading.
    c. Recheck at 90° position to give cross reading.
    d. The maximum allowable radial play is .022". If radial play is excessive, rebuild the Turbocharger.
    e. Remove dial indicator.
12. If the unit is in satisfactory condition, install compressor housing (using a new gasket and torque the six bolts to 80 inch lbs.
13. Install carburetor to Turbocharger, then install the assembly onto the vehicle.

REPAIR PROCEDURES

NOTE: Always cover Supercharger openings when working on other parts of engine requiring Supercharger openings to be exposed or when unit is stored.

Removal

1. Remove spare tire.
2. Remove air cleaner assembly, then disconnect fuel line and choke heat tube at carburetor.
3. Remove Turbocharger heat shield, then disconnect oil feed line and drain line at Turbocharger housing.
4. Disconnect accelerator linkage at carburetor.
5. Loosen the turbine housing "V" clamp nut, then support the Turbocharger and carburetor; remove the clamp and lift the assembly out of the vehicle carefully to avoid damage to the turbine wheel or spillage of gas from carburetor bowl into engine.

NOTE: A holding fixture is provided as a special tool for the purpose of avoiding possible damage to the uncovered turbine wheel vanes and for convenience during Turbocharger overhaul.

6. Remove carburetor attaching nuts and remove carburetor from Turbocharger assembly.

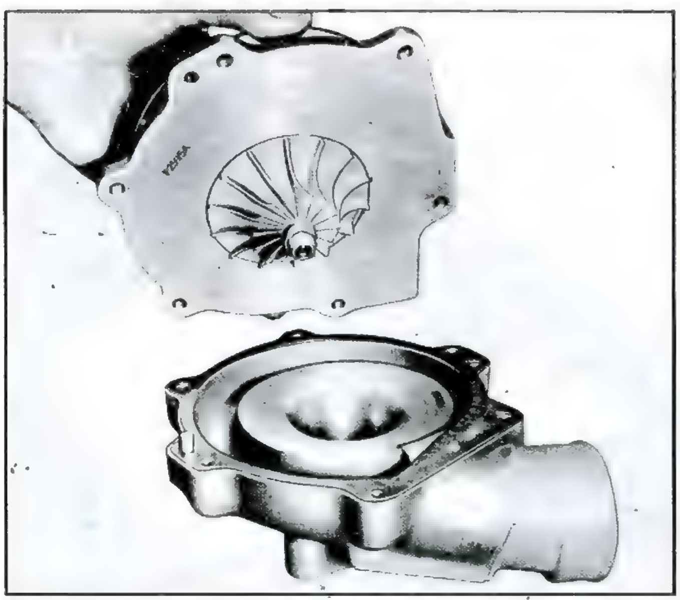


Fig. 39—Removing Compressor Housing

7. Remove 7 turbine housing inlet and outlet flanges bolts and remove the housing if inspection shows need.

Disassembly

NOTE: Disassemble the Turbocharger in a clean, dust-free location, using clean tools and equipment. Avoid contact with dust or grit that could score the highly machined parts and result in premature failure of the unit.

1. Remove the six bolts that secure the compressor housing to the bearing housing, then remove the compressor housing and gasket (fig. 39).
2. Hold the turbine wheel blades with a cloth and remove the self-locking nut (LEFT HAND THREADS) from the impeller end of the turbine shaft by turning clockwise (fig. 40), then remove the impeller washer.
3. Support the Turbocharger in a press (using parallel blocks or support ring Tool J-21004, with the impeller wheel upward.
4. Place a folded cloth on the bed of the press (between parallel bars or inside the support ring) to avoid damage to the turbine wheel as it drops out of the housing.
5. Place a 1/4" diameter brass rod on the end of the turbine shaft (fig. 41) and press turbine shaft from impeller wheel.
6. Remove impeller wheel, shim or shims, shaft sleeve, turbine wheel and shaft assembly, turbine shield and shield spring ring.

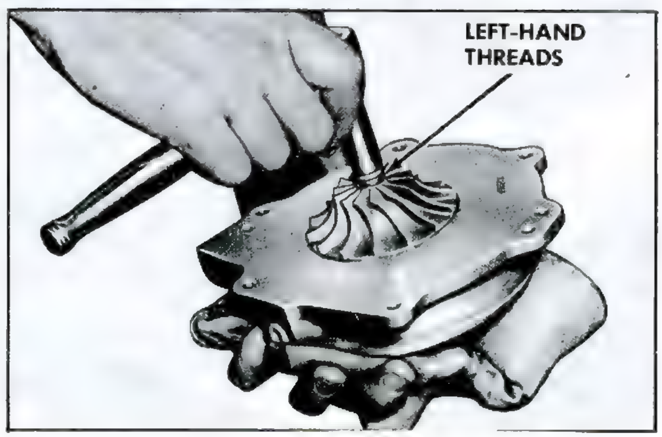


Fig. 40—Removing Impeller Nut

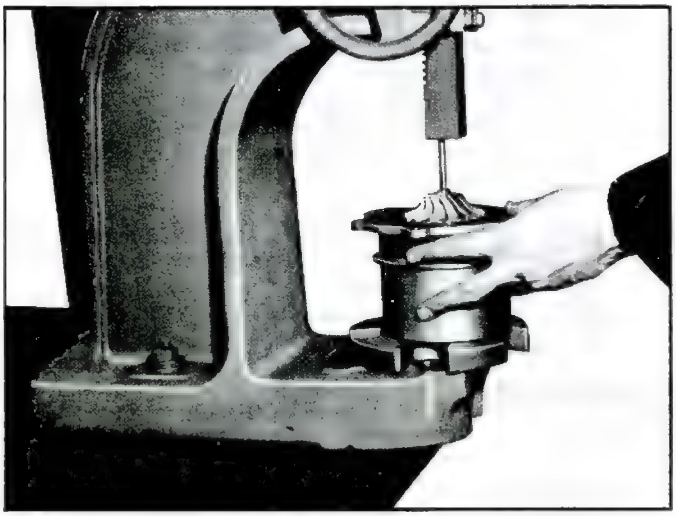


Fig. 41—Pressing Turbine Shaft from Impeller

7. Remove the oil seal retaining ring from bearing housing with snap ring pliers (fig. 42).
8. Turn the bearing housing over and, using a 1/2 inch diameter rod, push oil seal, "O" ring and mating ring out of the bearing housing.
9. Remove the bearing retainer ring (fig. 43), then remove the bearing and shim.

Cleaning and Inspection

1. Wash the Supercharger parts with Diesel oil or kerosene, allowing to soak, if required, to remove carbon deposits. A small nylon bristle brush may be used to remove heavy deposits.

 CAUTION: Never use caustic solutions or other cleaner that may attack metal, or a wire brush that could score highly finished parts.

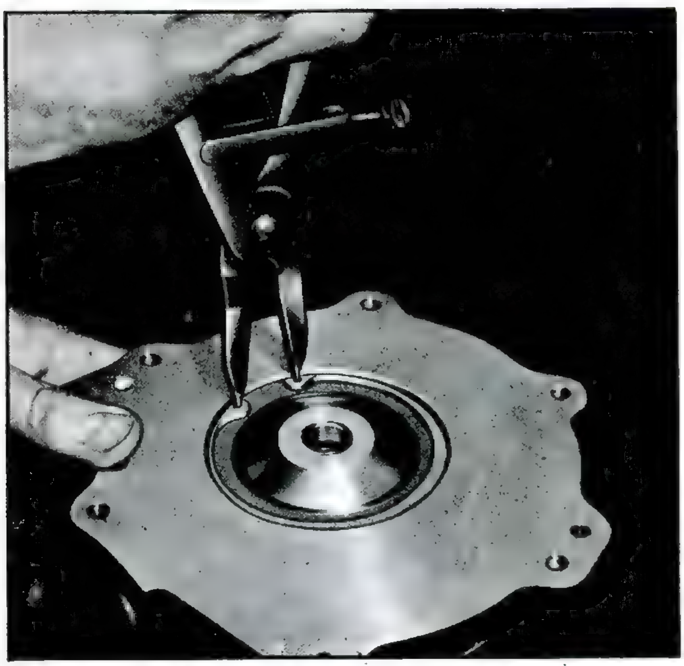


Fig. 42—Oil Seal Retainer Ring Removal

2. Inspect the turbine housing for:
   a. Wiping, scoring or pit marks in the inner contour.
   b. Cracks along dividing tongue.
   c. Damaged threads in tapped holes or on studs.
3. Inspect compressor housing for:
   a. Wiping, scoring, eroding or pit marks in the inner contour and scroll.
   b. Damage on gasket surface.
4. Inspect turbine wheel and shaft assembly for:
   a. Nicked, bent, broken or missing blades.
   b. Cracks at edge of blades.
   c. Scoring on back face or back hub.
   d. Excessive side wear or carbon build-up in shaft seal ring groove.
   e. Shaft discoloration due to overheating (normal color is light tan).
5. Inspect impeller for:
   a. Nicked, broken or missing blades.
   b. Evidence of rubbing on blades or back face.
   c. Fit of impeller on turbine shaft (must be press fit).
6. Inspect bearing housing for:
   a. Scoring, heavy wear on the bearing bore.
   b. Cracked or damaged bearing flange face.
   c. Damaged "O" ring seats or snap ring grooves.
   d. Thread damage in oil inlet or outlets.
   e. A secure bearing roll pin.
7. Inspect the bearing for:
   a. Scuffing, pit marks, scrathces.
   b. Imbedded foreign material.
   c. Damage to thrust surfaces.
   d. Damage on external diameter or shim surface.
8. Inspect turbine shield for flatness, scoring, eroding or pitting and spring ring for damage, warpage or loss of tension.
9. Check mating ring for scuffing, discoloration or carbon build-up on sealing or thrust surfaces.
10. Inspect the oil seal assembly:
    a. For chipping, scoring or uneven and excessive wear on the carbon face seal insert.
    b. For damage to "O" ring seal groove.

Fig. 43—Removing Bearing Retainer Ring

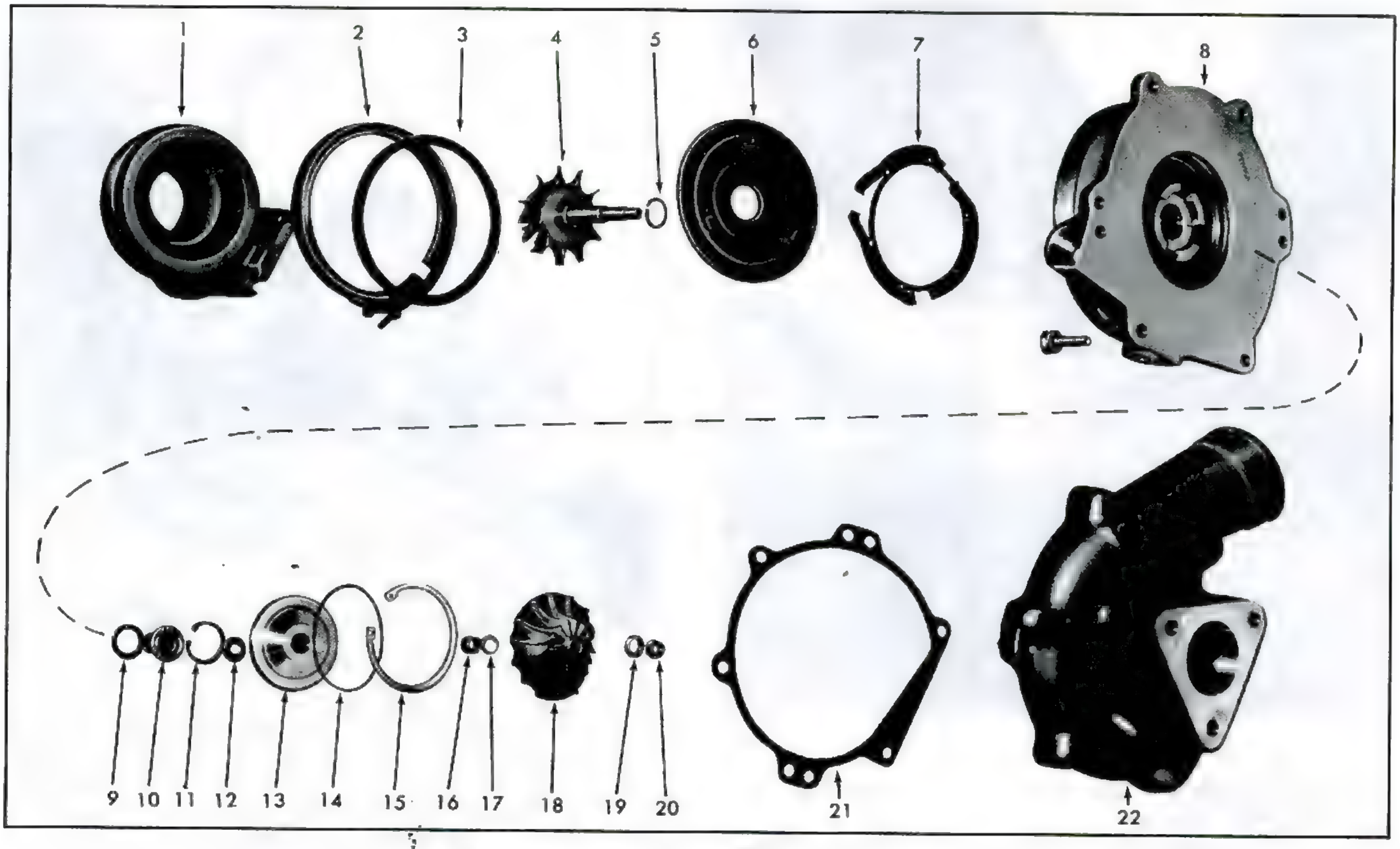


Fig. 44—Turbocharger—Exploded View

1. Turbine Housing
2. Turbine Housing Clamp
3. Gasket
4. Turbine Wheel and Shaft
5. Turbine Shaft Oil Seal Ring
6. Shield Plate
7. Spring Ring
8. Bearing Housing
9. Bearing Shim
10. Bearing
11. Bearing Retaining Ring
12. Mating Ring (Washer)
13. Oil Seal Assembly
14. "O" Ring Seal
15. Seal Retaining Ring
16. Shaft Sleeve
17. Impeller Shim
18. Impeller
19. Impeller Special Washer
20. Impeller Nut
21. Compressor Housing Gasket
22. Compressor Housing

c. To see that the carbon seal is free floating and has satisfactory spring tension.

11. Inspect the housing "V" clamps for cracks, stripped threads, distortion or other damage.

Assembly

NOTE: Replace all gaskets, the "O" ring seal and unserviceable parts.

NOTE: It is important to have cleaned all parts and work in a clean area using clean tools.

1. Support the bearing housing on support ring (Tool J-21004) with flat surface (impeller side) upward.
2. Install a new roll pin in the bearing housing (if required) so the slot is aligned radially inward.
3. Determine shaft-to-bearing end play as follows:
   a. Place bearing, mating ring and sleeve on turbine shaft.
   b. Hold the mating ring against the shoulder on the turbine shaft, then hold the bearing up against the mating ring and measure the clearance between the bearing and lower shoulder of the shaft using a feeler gauge (fig. 45).
   c. Write this clearance down on paper for later reference (when determining impeller end clearance).
4. Determine bearing-to-housing end play and select the proper shim.
   a. Install the bearing into the housing (line up roll pin and hole in flange) then install retaining snap ring.
   b. Position a dial indicator with point resting on the bearing (fig. 46) and set indicator needle at zero.
   c. Push the bearing upward against the retaining ring and then down to bottom in the housing and record the variation (repeat at least once to be sure of reading).
   d. Remove the retaining snap ring and bearing and select the shim that will reduce the end play to .001"-.002". (i.e. indicator shows end play was .015"; use one .014" shim to reduce to .001-.002.)

NOTE: Shim available sizes are .008, .009, .010, .011, .012 and .014.

   e. The adjusted end play of bearing-to-housing (.001-.002) plus the shaft-to-bearing end play (paragraph 3c) is the total shaft end play.
   i.e.

shaft-to-bearing end play	.004
plus bearing-to-housing end play	.001
total shaft end play is	.005

Fig. 45—Measuring Bearing-to-Shaft End Play

5. Install selected shim, bearing and bearing retainer ring (bevel side up).
6. Position mating ring centered on the bearing flange face.
7. Lubricate "O" ring seal with silicone grease and install in groove of oil seal assembly.
8. Install oil seal assembly into the housing by pressing by hand as far as it will go, then install the retaining ring (bevel side up) to hold it in place.
9. Determine the impeller shim requirements (for impeller-to-housing clearance) as follows:

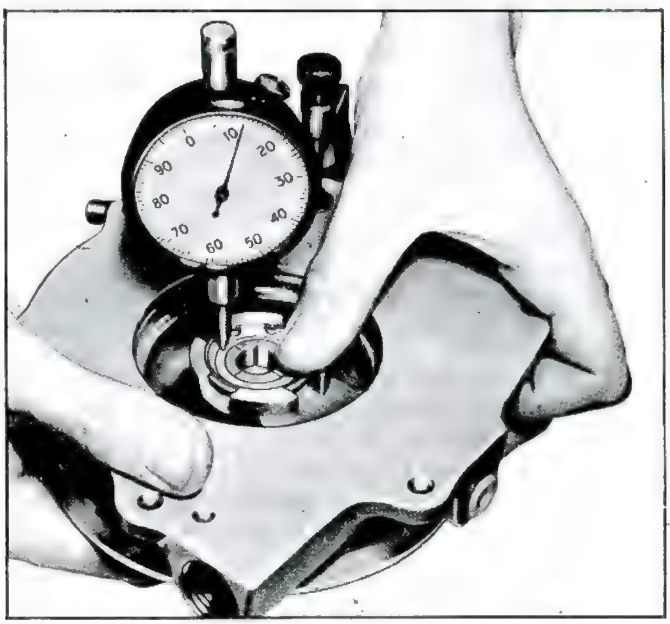


Fig. 46—Gauging Bearing-to-Housing End Play

Fig. 47—Gauging Impeller-to-Housing Clearance

a. Place the shaft sleeve in center of oil seal assembly, then place the impeller over the seal so its center hub rests on the shaft sleeve.
b. Install gasket and compressor housing in place on bearing housing and install every other bolt (3). Torque the bolts to 80 in. lbs.
c. Install turbine wheel and shaft assembly (without seal) into impeller just enough to hold impeller to shaft.
d. Position a dial indicator as shown in Figure 47 with indicator point resting on turbine hub and set at zero. Lift straight up on the turbine wheel as far as it will go and note indicator reading. (Repeat impeller lift at least once to check your reading.)

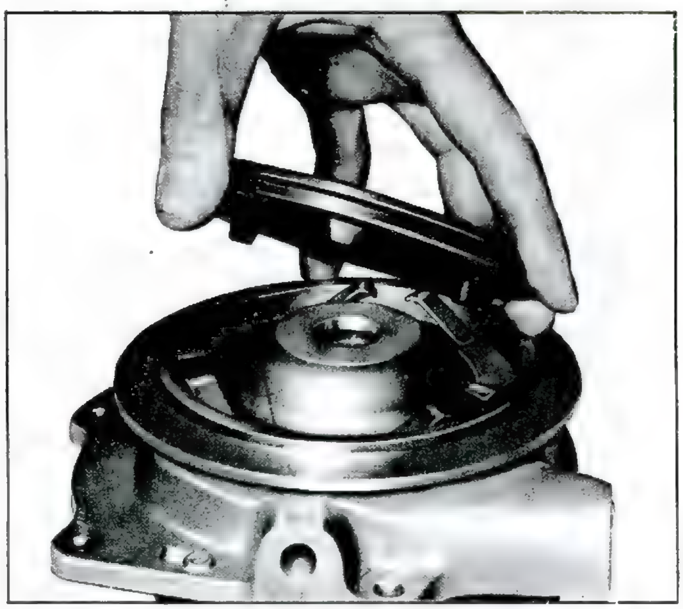


Fig. 48—Heat Shield Spring Ring Installation

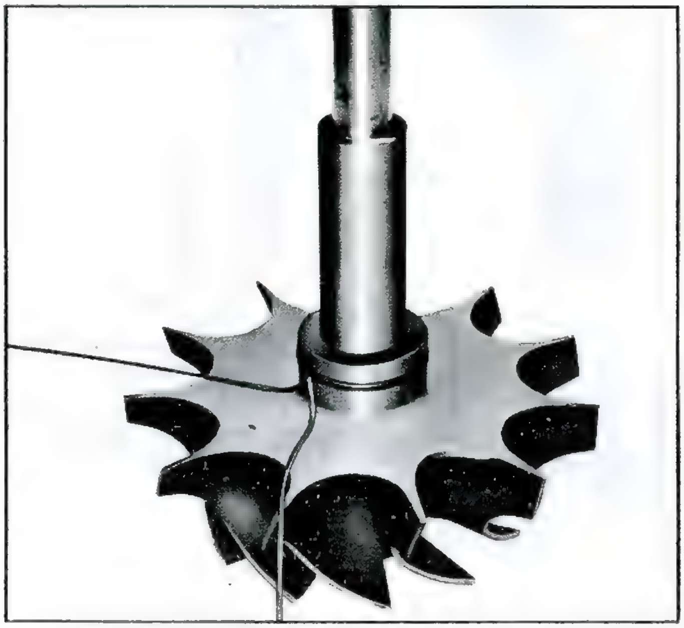


Fig. 49—Ring Compressed Using Tag Wire

e. Subtract the total shaft end play (paragraph 4e) from the indicator reading just recorded to obtain impeller-to-housing clearance and select shims as follows:

Impeller movement indicated reading . .	.037
Less total shaft end play	.005
Indicated clearance	.032

f. Select shim to reduce impeller clearance to .015-.020 from value determined in Step e as follows:

Measured in Step e	.032	.032
Less clearance needed	.015	.020
Shim thickness must be between	.017 Max.	.012 Min.

NOTE: Shim available in .010" and .015".

10. Remove the compressor housing, gasket, impeller, shaft sleeve and turbine wheel and shaft assembly from bearing housing.
11. Turn the bearing housing over (on ring support tool) and install spring ring. Position the turbine shield to install with three projections spaced over flat areas of the spring ring (fig. 48), then install "C" clamps to hold spring ring compressed.
12. Lubricate the turbine shaft seal ring groove with oil and install ring into groove. Compress the ring into the groove using tag wire (fig. 49) or a plastic compression ring (fig. 50). If tag wire is used, make one twist with pliers and bend the wire to form it along the curvature of shaft and wheel back face as shown in Figure 49. (Remember direction of twist for removal.)
13. Lubricate the shaft (bearing area) and carefully install through the bearing (fig. 51). The plastic ring is left on the shaft after installation since it will burn away. If wire is used, remove the wire by a reverse twist and slide it out from between shield and wheel.

CAUTION: Hold wheel so it will not slide out past ring.

14. Hold turbine wheel tightly against the shield (so ring seal will not fall out of seal area), turn the assembly over and place in a press so turbine wheel hub rests on press plate.
15. Install the shaft sleeve (fig. 52), impeller shim (determined in Step 8f) and start the impeller on the turbine shaft.
16. Press the impeller onto the shaft, using a hollow spacer such as Tool J-6880 until it bottoms in place (fig. 53), then remove "C" clamps.

NOTE: As an alternate method of assembly, the impeller may be heated to a temperature of not more than 300°F. and installed onto the turbine shaft by hand, without the need for a press.

17. Remove assembly from press and position the special impeller washer (fig. 54) with dished side upward and install (LEFT HAND THREADS) the self-locking nut on the turbine shaft. Use a folded cloth to hold the turbine wheel and torque the nut to 80 inch lbs.
18. Place the gasket and compressor housing on bearing housing, secure with six bolts and torque to 80 in. lbs.
19. Remove the holding tool from the oil drain opening, then (with assembly in approximate installed position) add oil into oil inlet until it flows from drain

Fig. 50—Compressing Ring, Using Plastic Installer Ring

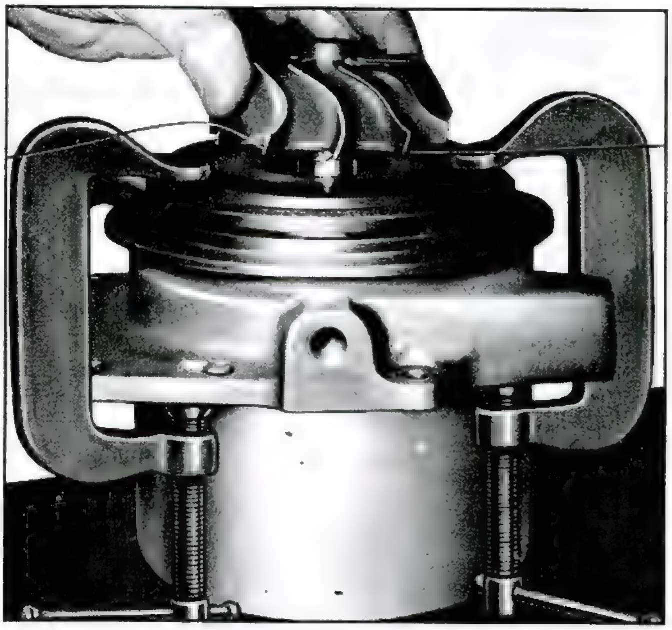


Fig. 51—Installation of Turbine Wheel and Shaft

opening; install holding tool and install carburetor for installation on vehicle.

NOTE: If the Supercharger is not going to be installed immediately, cover all openings to prevent damage or entrance of foreign matter.

20. If inspection shows turbine housing damage, remove housing for replacement as follows:
    a. Remove 4 nuts from turbine inlet flange and 3 nuts from outlet flange.
    b. Loosen muffler mounting strap so turbine outlet pipe can be wobbled.
    c. Slide turbine outlet pipe flange from turbine by wobbling as needed, then lift turbine housing from inlet pipe flange.
    d. Remove 2 choke heat tubes from inlet flange on housing and install them in new housing flange.

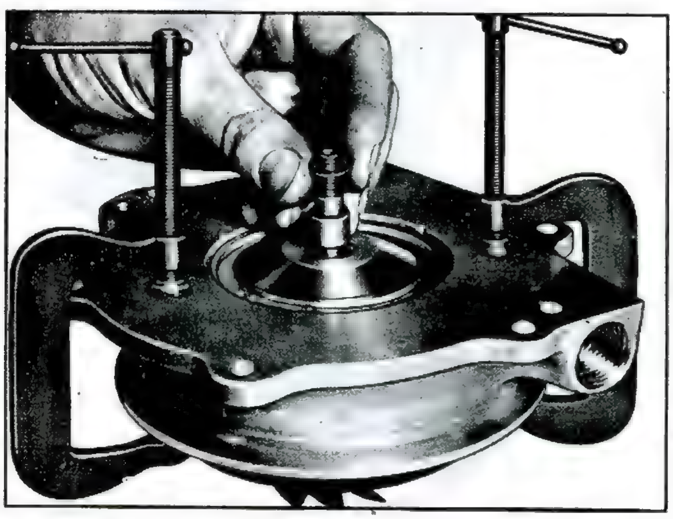


Fig. 52—Shaft Sleeve and Shim Installation

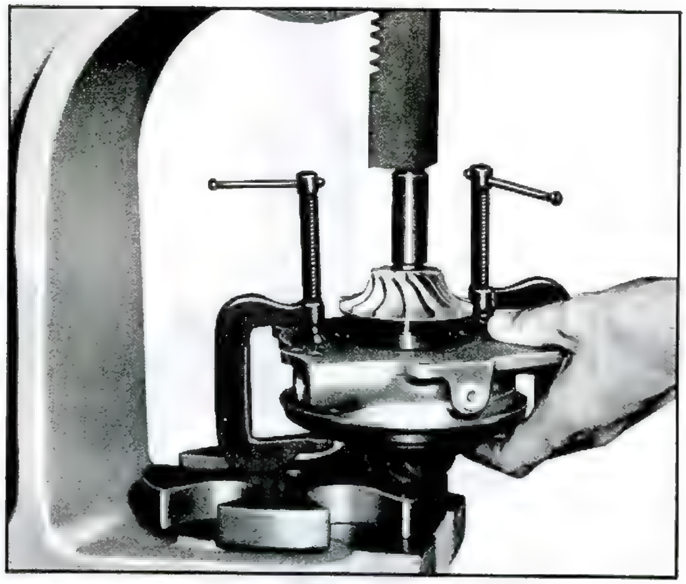


Fig. 53—Impeller Installation

21. Install turbine housing as follows:
    a. Place new inlet flange gasket over studs on inlet pipe flange.
    b. Place new outlet flange gasket on turbine housing outlet flange studs.
    c. Hold outlet pipe outboard on vehicle and install turbine housing over inlet flange studs and gasket.
    d. Slide outlet pipe over turbine outlet flange studs and gasket.
    e. Install seven stud nuts (4 on inlet, 3 on exhaust) and torque to 80 in. lbs.
    f. Tighten muffler mounting strap.

Installation

1. Position gasket around turbine wheel shield and CAREFULLY hold Turbocharger and carburetor assembly in place against turbine housing on vehicle and install turbine housing ("V" type) clamp around flanges so the clamp nut and stud will be to the top of the assembly with nut installed from rear of vehicle.
2. Rotate the assembly as necessary to align manifold tube hose and oil lines, then torque the clamp nut to 30-40 in. lbs.

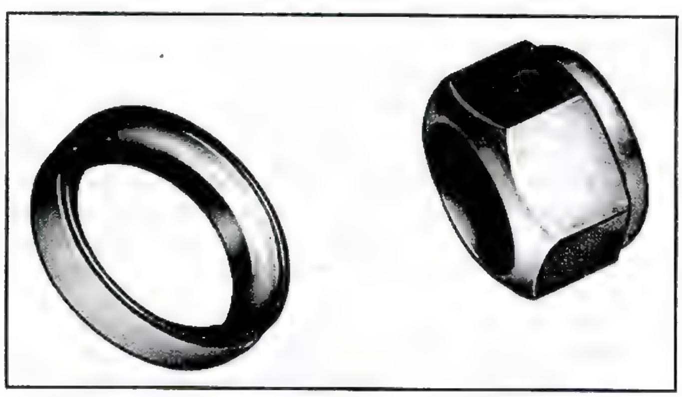


Fig. 54—Special Washer and Nut

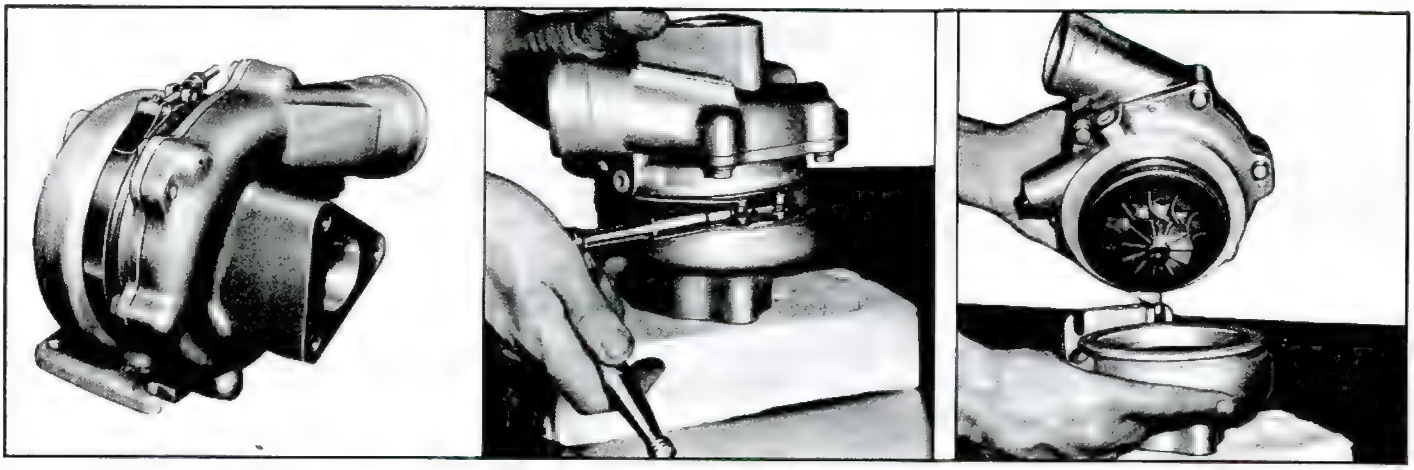


Fig. 55—Removal of the Turbine Housing for Installation of Replacement Turbocharger

3. Connect manifold cross tube hose, oil drain and oil feed lines at Turbocharger bearing housing.
4. Connect accelerator linkage at carburetor and check adjustment.
5. Connect fuel line and choke heat tube at carburetor.
6. Install air cleaner, connect choke clean air tube at cleaner, and ventilation hose at air cleaner to engine tubing.

Installing Replacement Turbocharger

When installing a replacement unit, remove the Turbocharger "V" clamp and separate the turbine housing from the rest of Turbocharger; install choke heat tubes, then install the turbine housing section separately as outlined above.

Transfer oil line fittings to Turbocharger housing; install carburetor to Turbocharger, then install this assembly as outlined above.

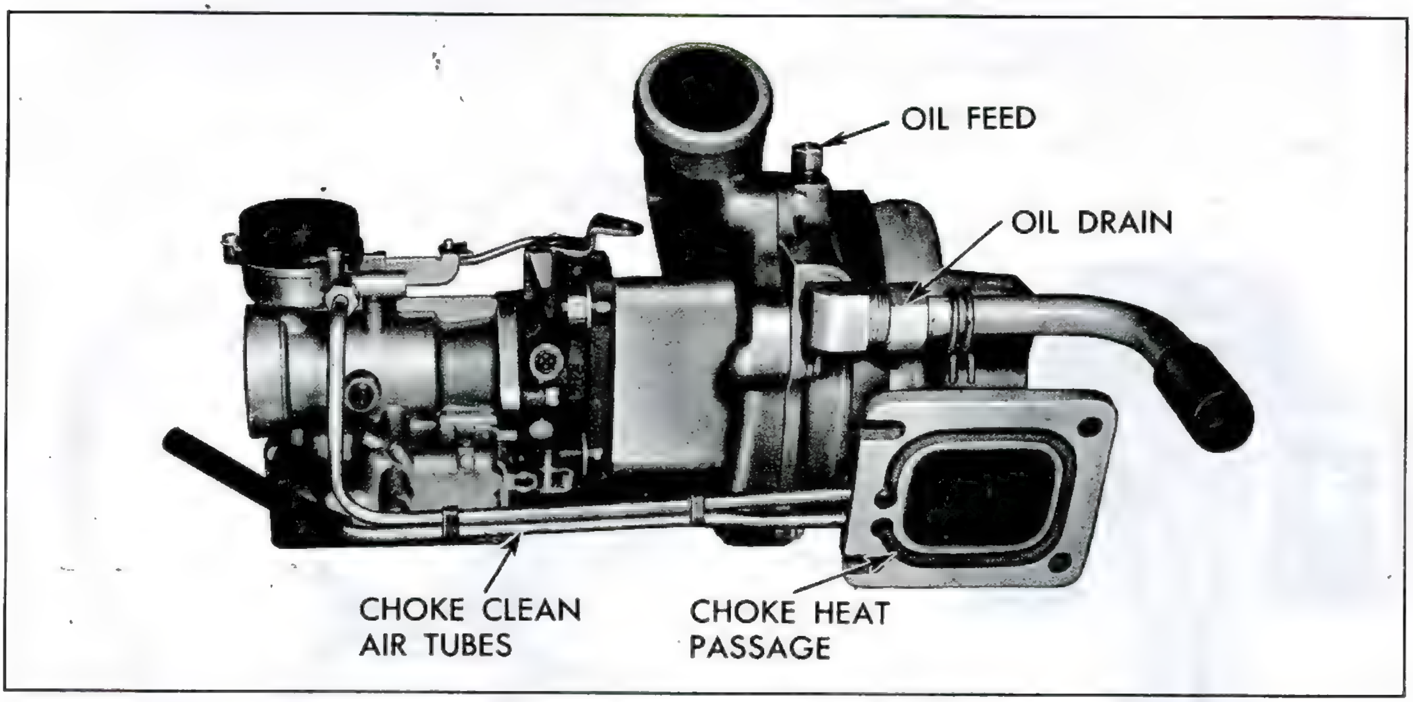


Fig. 56—Turbocharger Fittings and Passages

FUEL PUMP

INDEX

GENERAL DESCRIPTION

The fuel pump (fig. 57) used on the Corvair engine is of the diaphragm type. It is operated by a push rod which rides on an eccentric located near the rear end of the engine crankshaft. The return spring is incorporated into the push rod.

SERVICE PROCEDURES

Inspection and Test

Always check pump while it is mounted on the engine and be sure there is gasoline in the tank.

The line from the tank to the pump is the suction side of the system and the line from the pump to the carburetors is the pressure side of the system. A leak on the pressure side, therefore, would be made apparent by dripping fuel, but a leak on the suction would not be apparent for its effect of reducing volume of fuel on the pressure side.

1. Tighten any loose line connections and look for bends or kinks in lines which would reduce fuel flow.
2. Tighten diaphragm flange screws.
3. Disconnect fuel pipes at carburetors. Disconnect distributor to coil primary wire so that engine can be cranked without firing. Place suitable containers at ends of pipes and crank engine a few revolutions.

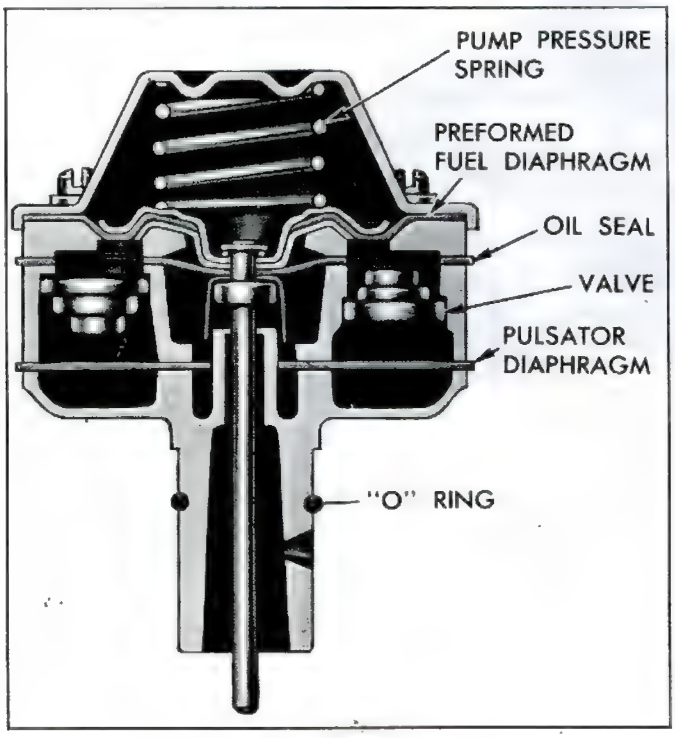


Fig. 57—Fuel Pump—Section View

If little or no gasoline flows from open end of pipes then fuel pipe is clogged or pump is inoperative. Before removing pump disconnect fuel pipe at gas tank and inlet pipe and blow through them with an air hose to make sure they are clear. Reconnect pipes to pump and retest while cranking engine.

CAUTION: Whenever the engine is cranked remotely at the starter, with a special jumper cable or other means, the primary distributor lead must be disconnected from the negative post on the coil and the ignition switch must be in the "ON" position. Failure to do this will result in a damaged grounding circuit in the ignition switch.

4. If fuel flows from pump in good volume (1 pint in 40 seconds or less at cranking speed) from pipes at carburetors, check fuel delivery pressure to be certain that pump is operating within specified limits as follows (fig. 58):

Fig. 58—Pressure Test

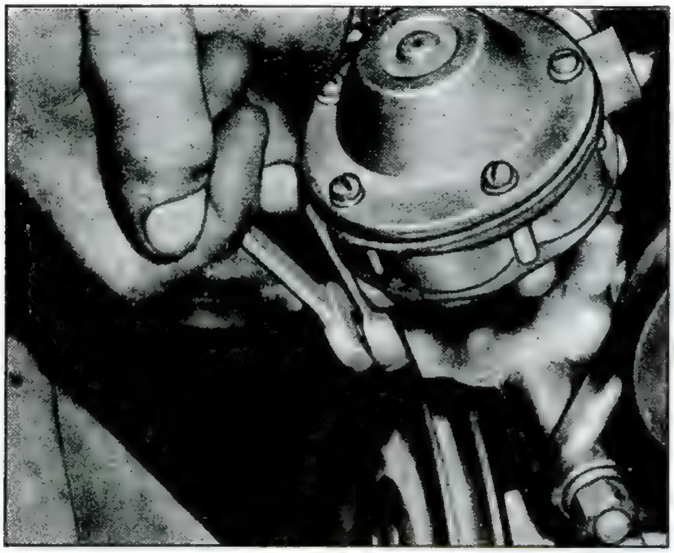


Fig. 59—Loosening Locknut

- Attach a fuel pump pressure test gauge to disconnected end of pump to carburetor pipe.
- Run engine at approximately 500 to 1,000 rpm on gasoline in carburetor bowls and note reading on pressure gauge.
- If pump is operating properly the pressure should be 4 to 5 lbs. and will remain constant at speeds between idle and 1,000 rpm. If pressure is too low or too high, or varies materially at different speeds, the pump should be removed for repair or replacement.

Removal

1. Disconnect fuel inlet line at fuel pump and both outlet lines at the "T" connector. Leave the "T" connector and pipe in pump.
2. Loosen the jamb nut locking set screw in place and remove set screw (fig. 59).
3. Carefully remove fuel pump, and push rod assembly (fig. 60) from engine.

After removal of pump from engine and before disassembly, plug all openings, and carefully wash exterior of pump with cleaning solvent to remove all dirt and grease.

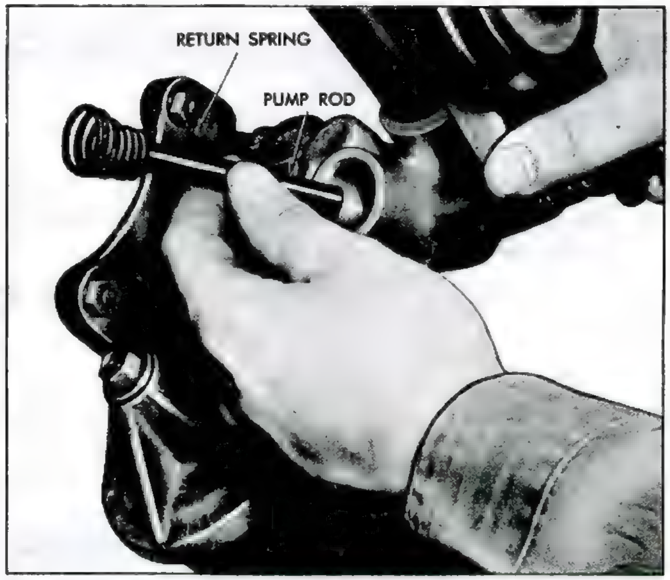


Fig. 60—Removing Push Rod

Disassembly

1. Remove five bolts attaching diaphragm cover to body. Remove cover, spring and diaphragm and body assembly.

   NOTE: Diaphragm and body assembly includes the fuel diaphragm, oil seal, and control rod.

2. Remove lower body and pulsator diaphragm from pulsator cover.
3. Remove valves from lower body by removing metal displaced by staking and pulling out valves with hook shaped tool.

Cleaning and Inspection

1. Clean and rinse all metal parts in solvent. Blow out all passages with air hose.
2. Inspect all parts for cracks, breakage and distortion. Examine all screw holes for stripped or crossed threads. Replace damaged parts.

Assembly

1. Assemble pulsator cover, pulsator diaphragm, lower

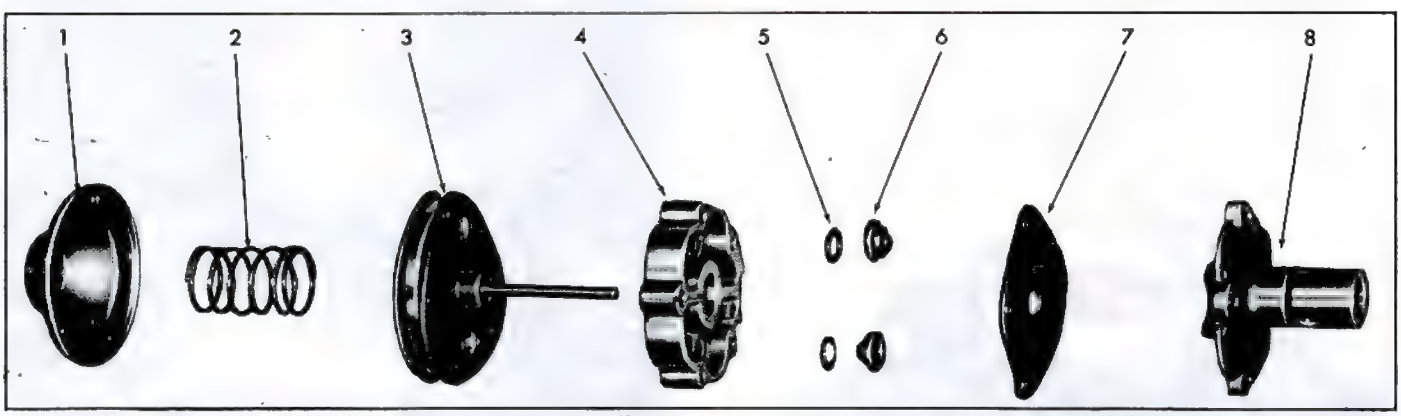


Fig. 61—Fuel Pump—Exploded View

1. Cover
2. Spring
3. Diaphragm and Body Assembly
4. Lower Body
5. Valve Gasket
6. Valve
7. Pulsator Diaphragm
8. Pulsator Cover

body (with valves replaced and staked), body and diaphragm assembly, spring and cover. Install bolts and draw up equally until tight.

NOTE: One bolt hole is offset to assure proper positioning of component parts.

Installation

1. Install "T" connector and pipe in pump "outlet" connection.
2. Install the pump into the accessory housing, outlet connection to front. Carefully feel pump position with set screw, being sure set screw pilots in locking hole.
3. Tighten set screw 9 to 15 ft. lbs. Then tighten locknut 9 to 15 lbs.
4. Install inlet fuel line to inlet connection on fuel pump and outlet lines to the "T" connector.

AIR CLEANERS

INDEX

GENERAL DESCRIPTION

The Corvair uses one large oil-wetted paper element air cleaner (fig. 62). All except the Turbocharger air cleaner are centrally mounted on a diffuser tube between the carburetors. The diffuser tube assembly is gasket mounted and held down by a J-shaped bolt and a nut at each carburetor.

The sedan with air conditioning uses two oil-wetted paper element air cleaners (fig. 63).

Oil-bath type pre-cleaner air cleaners are available as an option for extremely dusty driving conditions.

SERVICE PROCEDURES

OIL WETTED PAPER

Every 12,000 miles or more often in dusty areas, either replace paper air cleaner element or test element using Tool J-7825.

Before testing, inspect for holes or breaks in the element, as these defects require immediate replacement. If testing indicates that the element restriction is satisfactory at 12,000 miles, the element need not be replaced but should be retested every 6,000 miles thereafter, until replaced.

Replacement

1. Remove wing nut and cover.
2. Remove paper element and discard.
3. Remove bottom section of air cleaner and gasket on diffuser tube. Discard gasket.
4. Clean bottom section of air cleaner and cover pieces thoroughly to remove dust and grime.

   NOTE: Check bottom section of air cleaner seal for tears or cracks.

5. Install a new gasket and set bottom section of air cleaner on diffuser tube.

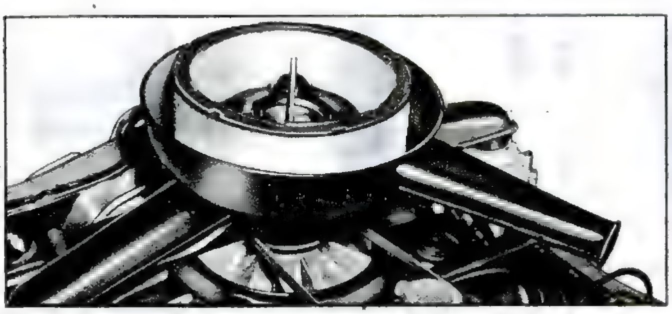


Fig. 62—Single Air Cleaner

6. Install new paper element on bottom section of air cleaner with either end up.

   NOTE: Plastisol seat is the same material on both ends.

7. Install cover and wing nut.

Testing

Tool J-7825 is designed to check paper element air

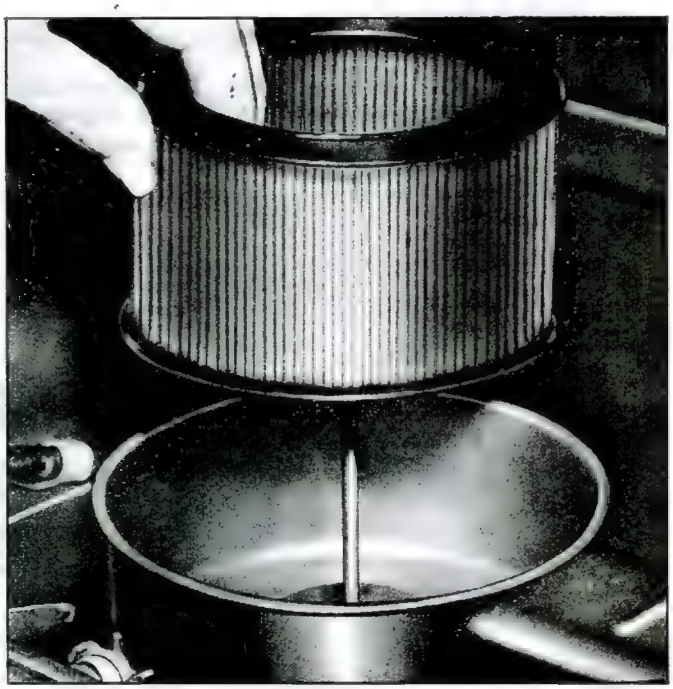


Fig. 63—Dual Air Cleaner

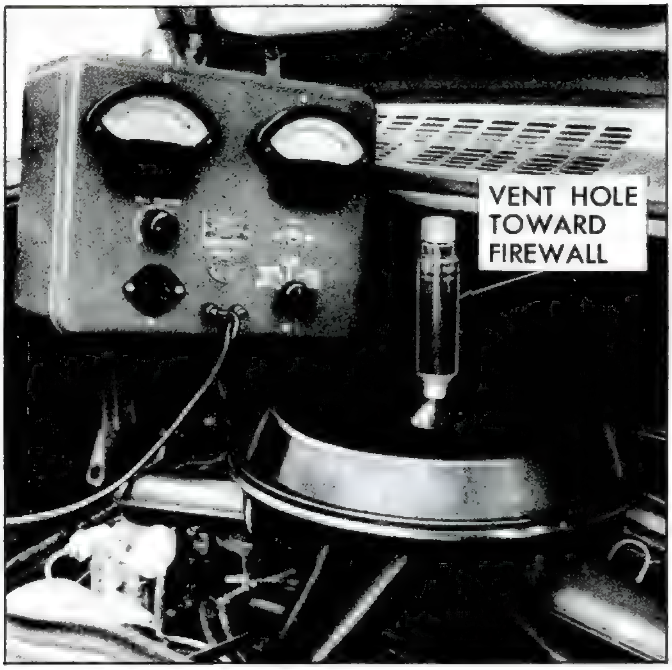


Fig. 64—Tool Installed on Air Cleaner

cleaners to determine whether the element has materially decreased in efficiency and should be replaced or has only slightly increased air restriction and is suitable for further service. In combination with a tachometer, this instrument will quickly and accurately determine the air cleaner element condition without removing the element from the air cleaner.

1. Remove the wing nut and washer (if used) from the air cleaner cover stud, then screw Tool J-7825 onto the stud until it seals tightly against the air cleaner cover. Rotate the entire gauge so that the scale can be read from the rear of the car (fig. 64).
2. Connect a tachometer and place so that it may be read simultaneously with Tool J-7825 (fig. 64).

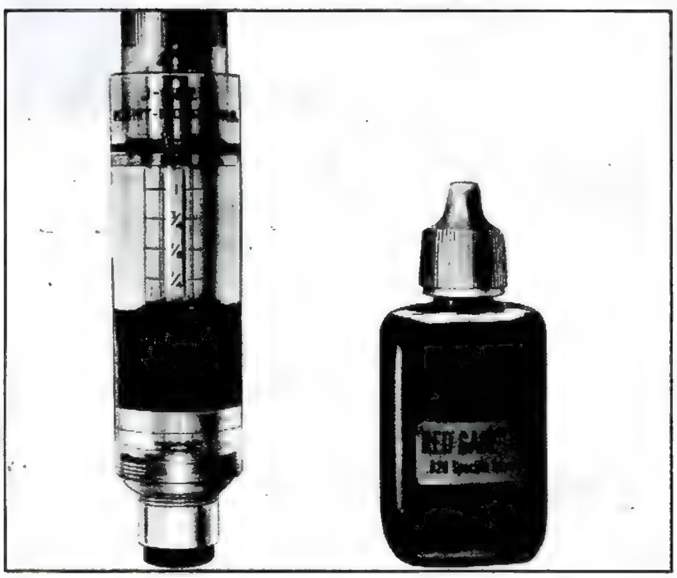


Fig. 65—Tool J-7825

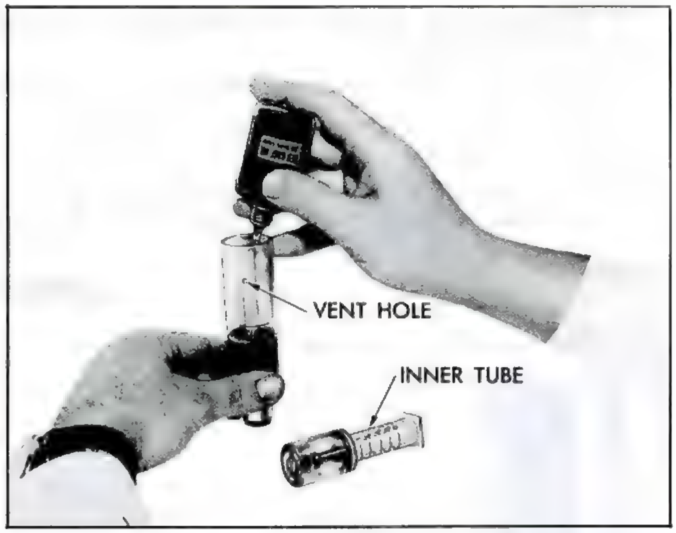


Fig. 66—Filling Tool with Oil

3. Start engine. If engine is cold, allow to run for 2 to 3 minutes. The automatic choke must be fully open.
4. Accelerate the engine slowly until the oil level in Tool J-7825 just reaches the 1/4" mark. Allow engine speed to stabilize and note tachometer reading. Decelerate engine.
5. If the tachometer reading is at or below the following, the paper air cleaner element is restricted beyond the allowable limit and should be replaced.

Engine	Minimum Allowable RPM @ ¼" H_2O
95 H.P.	2600 R.P.M.
110 H.P.	2600 R.P.M.
140 H.P.	1900 R.P.M.
Dual Air Cleaner	2400 R.P.M.

6. Remove tachometer and Tool J-7825 from vehicle and push down inner tube until seal is below vent hole to prevent oil loss.

Tool J-7825

Tool J-7825 (fig. 65) is shipped dry and must be filled with the red gauge oil (specific gravity .826) provided.

Filling Tool

Pull the knurled inner tube completely out of the gauge and add oil to the reservoir until the oil level is between the two "FILL" lines, Figure 66. Refill whenever the level falls below the lower "FILL" line.

Storing Tool

When the gauge is not in use, fully depress the inner tube. This seals off the oil reservoir from the vent hole to prevent oil loss if the gauge is tipped.

OIL BATH PRECLEANER

Maintenance

1. Loosen and remove wing stud.
2. Remove air cleaner from the vehicle and then remove the filter element assembly.

3. Empty oil out of cleaner and clean out oil and accumulated dirt.
4. Wash body with cleaning solvent and wipe dry.
5. Wash filter element by slushing up and down in cleaning solvent.
6. Dry filter unit with an air hose or let stand until dry.
7. Fill body of cleaner with one pint of SAE 50 engine oil. If expected temperatures are to be consistently below freezing, use SAE 20 engine oil.
8. Assemble filter and cover assembly to body of cleaner.
9. Install cleaner, making sure it fits tight and is set down securely.
10. Install cover wing stud.

SPECIAL TOOLS

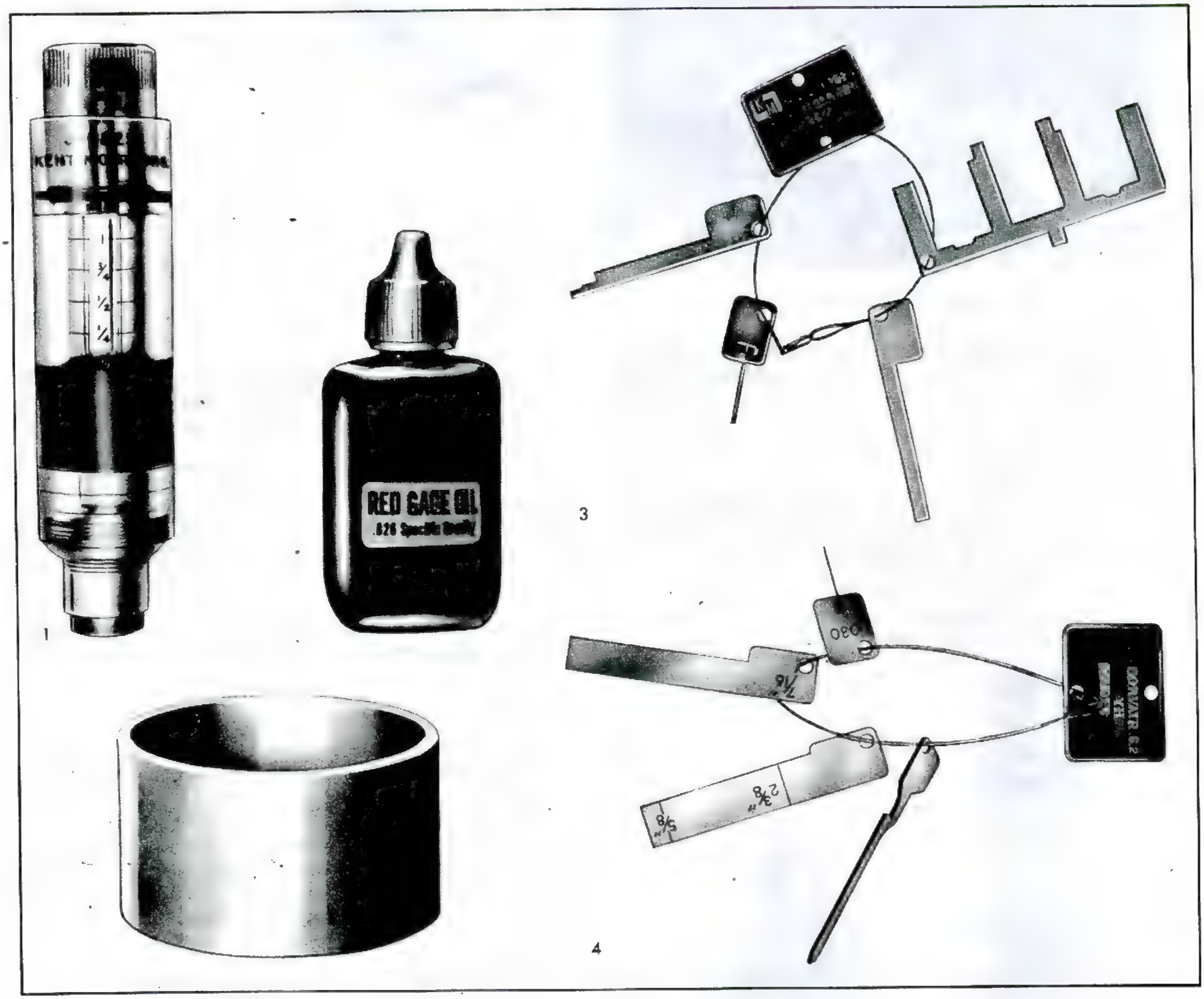


Fig. 67—Engine Fuel Special Tools

1. J-7825 Air Cleaner Tester
2. J-21004 Turbocharger Support
3. J-21604 Carburetor Chain Gauge
4. J-21056 Carburetor Chain Gauge

SECTION 6Y

ENGINE ELECTRICAL

CONTENTS OF THIS SECTION

BATTERY

INDEX

GENERAL DESCRIPTION

The source of electrical power for operating the electrical current consuming automotive components may be either the battery or generator or, under certain conditions, both the battery and the generator. It is the role of the battery to furnish electrical power for the electrical accessories when the engine and generator are not in operation. The battery not only furnishes the electrical power necessary for cranking the engine, but must also help in cases where generator output is not sufficient to handle the electrical loads.

The "dry charge" battery contains fully charged positive and negative plates separated by high-quality separators. The battery contains no electrolyte until it is activated for service in the field and therefore leaves the factory dry.

Venting of the Corvair battery is accomplished by two vent plug adapters and hoses which vent battery gas or vapors to the outside of the engine compartment (fig. 1b).

COMMON CAUSES OF FAILURE

When a battery fails, the cause of failure may lie outside the battery itself. For this reason when a battery failure is encountered, do not be satisfied to merely recharge or replace it. Find the cause of failure and prevent recurrence of the trouble. Listed below are some of the common causes of battery failure:

1. Defect in the generating system such as high resistance, slipping fan belt, faulty generator or regulator.
2. Overloads caused by defective starting or excessive use of accessories.
3. Driver habits or driving conditions such as using the vehicle only for short drives.

Liquid level in the battery should be checked regularly. If the liquid level is found to be low, colorless, odorless drinking water should be added to each cell until the liquid level rises to the bottom of the split ring in the cell filler well.

Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with colorless, odorless drinking water.

The top of the battery should be clean and the battery hold-down bolts properly tightened. Particular care should be taken to see that the tops of the 12-volt batteries are kept clean of acid film and dirt because of the high voltage between the battery terminals. For best results when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present and then flush off with clean water. Care must be taken to keep vent adapters tight so that the neutralizing solution does not enter the cell. The hold-down bolts should be kept tight enough to prevent the battery from shaking around in its holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

To insure good contact, the battery cables should be tight on the battery posts. Oil the battery terminal felt washer. If the battery posts or cable terminals are corroded, the cables should be cleaned separately with a soda solution and a wire brush. After cleaning and installing clamps, apply a thin coating of petrolatum to the posts and cable clamps to help retard corrosion. See Figure 10 for correct installation of cable terminal clamps.

QUICK-IN-THE-VEHICLE TESTS

1. Visual Inspection
2. Light Load Test

VISUAL INSPECTION

Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked

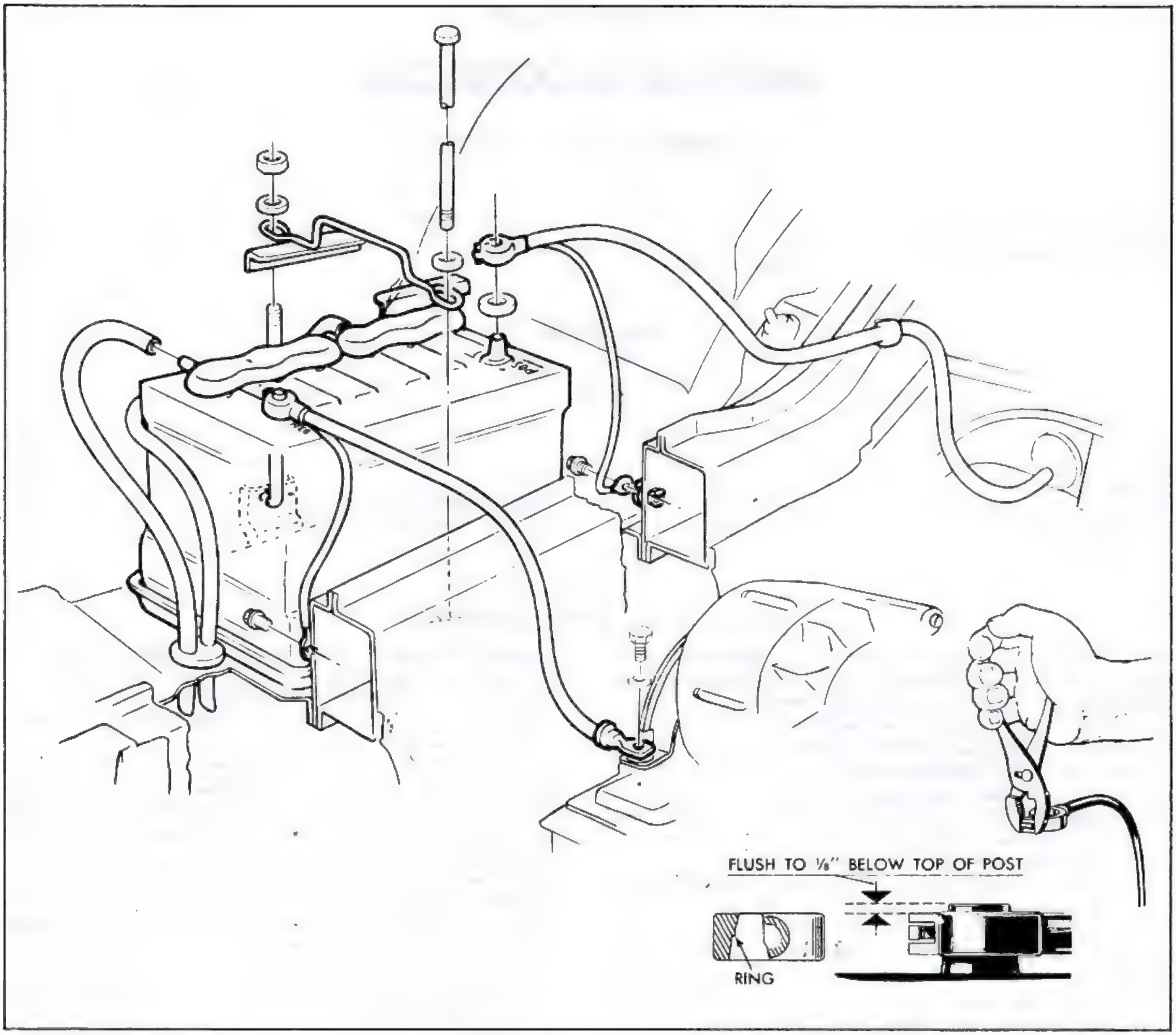


Fig. 1b—Battery Installation

cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with colorless, odorless drinking water.

LIGHT LOAD TEST

Check electrical condition of battery cells as follows:

1. Check electrolyte level in each cell, and, if needed, adjust to proper level by adding water.
2. Place load on battery by holding ignition switch in the "Start" position for 3 seconds or until engine starts. If engine starts, turn off ignition immediately.
3. Turn on headlights (low beam). After 1 minute, with lights still "ON", read voltage of each battery cell with voltmeter, noting exact voltages (.01 volt division). It is necessary to remember only the highest and lowest cell voltage.

Uniform Readings

If all cells read 1.95 volts or more and the difference between the highest and lowest cells is less than .05 volts, battery is good and sufficiently charged.

However, if any cell reads less than 1.95 volts and difference between the highest and lowest cells is less than .05 volts, battery is good but should be fully recharged for good performance. Refer to "Battery Charging Rates".

Non-Uniform Readings

If any cell reads 1.95 volts or more and there is a difference of .05 volts or more between the highest and lowest cell, the battery should be replaced.

Low Readings

If all cells read less than 1.95 volts, battery is too

low to test properly. FAILURE OF THE METER TO REGISTER ON ALL CELLS DOES NOT INDICATE A DEFECTIVE BATTERY. Boost charge battery and repeat Light Load Test (Refer to "Battery Charging Rates"). If battery is found to be good after boosting, it should be fully recharged for good performance.

If none of the cells come up to 1.95 volts after the first boost charge, the battery should be given a second boost. Batteries which do not respond after second boost charge should be replaced.

> **NOTE:** If any battery found to be good by the Light Load Test does not perform satisfactorily in subsequent service, it should again be tested by the Light Load Test and if it still tests "good," it should be removed from the car and tested as outlined under OUT-OF-THE-VEHICLE CHARGING AND TESTING.

OUT-OF-THE-CAR CHARGING AND TESTING

The procedures outlined below under Slow Charging and The Full Charge Hydrometer Test should be used on:

Any battery originally found to be "good" by the Light Load Test, but which has since failed to perform satisfactorily in service and which still tests "good" by the Light Load Test.

> **CAUTION:** The "Full Charge Hydrometer Test" is not valid unless battery has been tested and found to be good by the Light Load Test.

SLOW CHARGING

- Adjust electrolyte to proper level by adding water, then charge battery at 5 amperes until fully charged. Full charge of the battery is indicated when all cell gravities do not increase when checked at three intervals of one hour and all cells are gassing freely.
- Due to the low rate during slow charging, plenty of time must be allowed. Charge periods of 24 hours or more are often required.

FULL CHARGE HYDROMETER TEST

1. Make sure battery is fully charged as described under "Slow Charging" above. HYDROMETER READINGS TAKEN ON PARTIALLY CHARGED BATTERIES ARE UNRELIABLE FOR THE FOLLOWING TEST:
2. Measure specific gravity of electrolyte in each cell (fig. 2b) and compare readings with the following:

- If cell readings range from 1.250 and 1.290, the battery is ready for use. (Readings should be corrected to 80°F for comparison.) All it needed was a full charge. Any variation in the specific gravity between cells within this range does not indicate a defective battery.
- If the specific gravity of any cell or cells falls outside this range, (1.250 to 1.290), replace the battery.

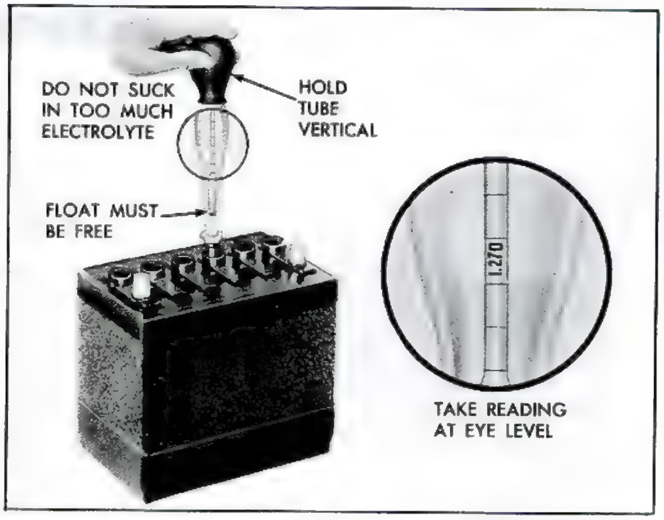


Fig. 2b—Testing Specific Gravity of Battery

BATTERY CHARGING RATES (SUGGESTED)

1. For those batteries which require a boost charge for the "Light Load Test" procedure.
2. For those batteries which have become discharged and require charging. It should be recognized that slow charging is the best and only method of completely recharging batteries. However, since time is often of importance to the battery owner two other methods are offered for partial battery re-charge.
3. For those dry charged batteries being activated with electrolyte at a temperature under 60°F or those batteries which are expected to go into immediate operation in below freezing weather.

12 VOLT BATTERY RE-CHARGE
(100 Amp/hr or Less Capacity)

TYPE OF CHARGE	LENGTH OF TIME	CHARGING RATE
Boost Charge for Light Load Test	20 Minutes	50 Amps
Slow Charge	24 Hours	4 Amps
Fast Charge	1-1/2 Hours	40-50 Amps
Quick Boost	30 Minutes	40-50 Amps
Dry Charge Warm-up Boost	10 Minutes	15 Amps

CHARGING SYSTEM

INDEX

GENERAL DESCRIPTION

The charging system includes the battery, generator, regulator, telltale light, ignition switch and necessary wiring to connect these components. The Delcotron is offered as a standard equipment, with two capacities available on all models.

The Delcotron continuous output A.C. generator (fig. 1c) consists of two major parts, a stator and a rotor. The stator is composed of a large number of windings assembled on the inside of a laminated core that is attached to the generator frame. The rotor revolves within the stator on bearings located in each end frame. Two brushes are required to carry current through the two slip rings to the field coils wound concentric with the shaft of the rotor. Six rectifier diodes are mounted in the slip ring end frame and are joined to the stator windings at three internally located terminals.

Diodes are mounted in heat sinks to provide adequate heat dissipation. The six diodes replace the separately mounted rectifier as used in other types of application. The diodes change the Delcotron A.C. current to D.C. current.

The function of the regulator in the charging system i to limit the generator voltage to a pre-set value by controlling the generator field current. The double-contact regulator assembly (fig. 2c) consists of a double contact voltage regulator unit and a field relay unit. This unit uses two sets of contact points on the voltage regulator unit to obtain desired field excitation under variable

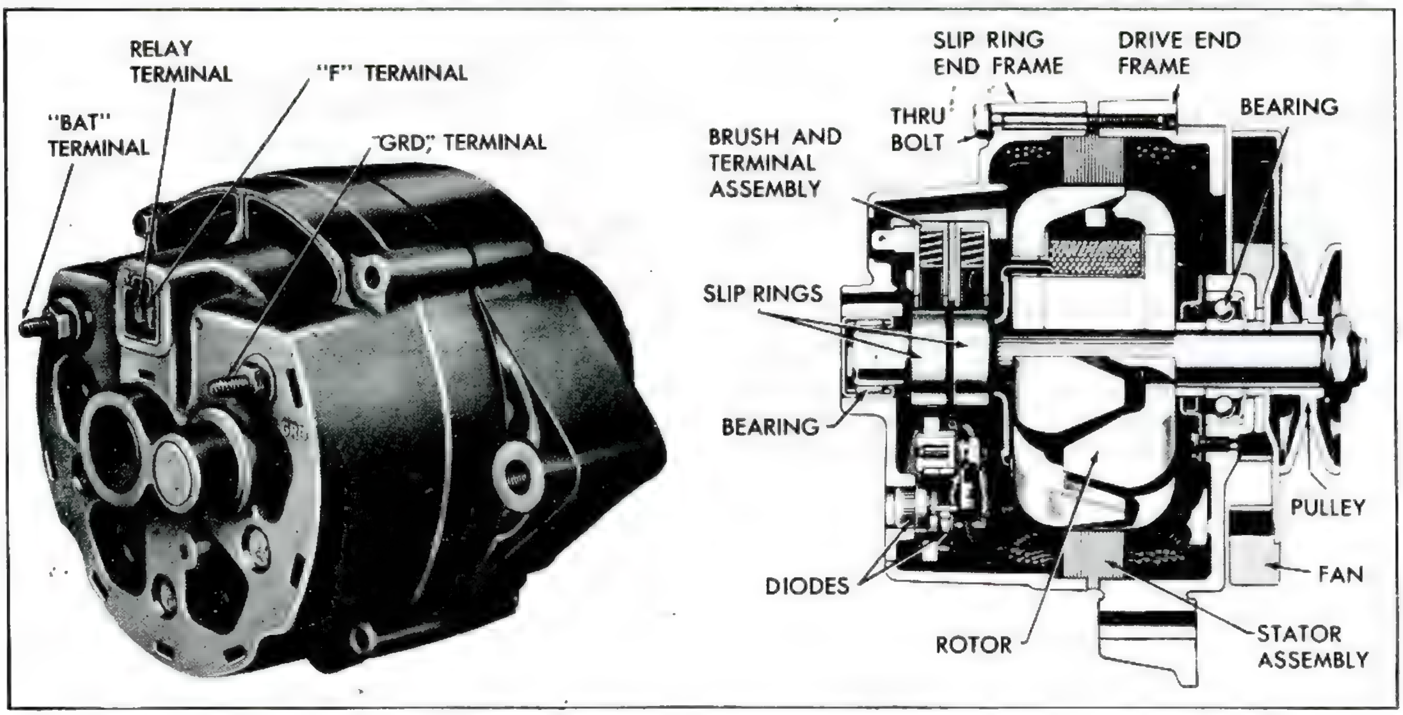
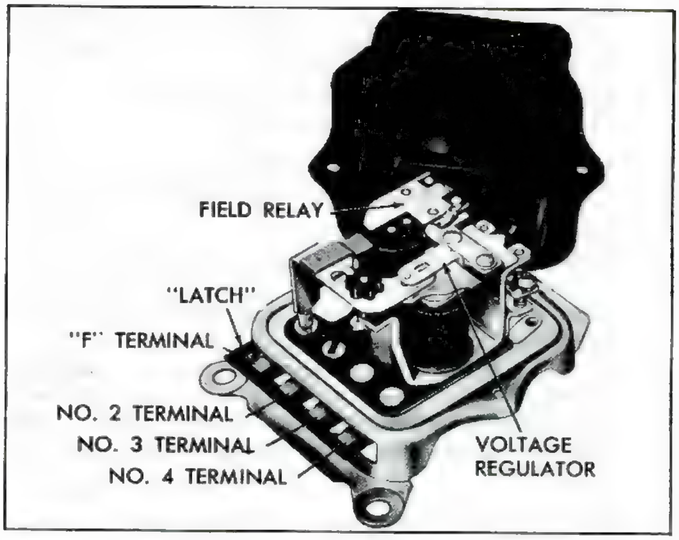


Fig. 1c—5.5" Delcotron



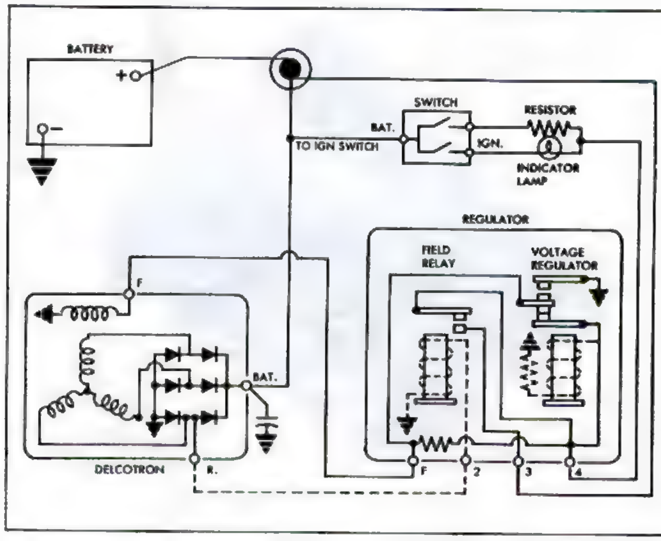


Fig. 2c—Two Unit Voltage Regulator

conditions. When the higher output Delcotron unit is used, the regulator incorporates an external field discharge diode in the field circuit as shown in Figure 3c. A wiring diagram of the regulator internal circuits is illustrated in Figure 2c.

The field relay unit allows the lamp to light (as a bulb check) with the ignition key on and engine not running. When the engine is started and the generator begins to charge, the indicator light goes out indicating that the system is operating normally.

MAINTENANCE AND ADJUSTMENTS

At regular intervals, inspect the terminals for corrosion and loose connections, and the wiring for frayed insulation. Check mounting bolts for tightness. Check the drive belt for alignment, proper tension and wear. Because of the higher inertia and load capacity of the rotor used in A.C. generators, PROPER BELT TENSION is more critical than on D.C. generators.

Since the Delcotron and its companion regulator are designed for use on negative polarity systems only, the following precautions must be observed. Failure to observe these precautions may result in serious damage to the charging system.

1. When installing a battery, always make absolutely sure the ground polarity of the battery, generator and regulator is the same.
2. When connecting a booster battery, make certain to connect the correct battery terminals together.
3. When connecting a charger to the battery, connect the correct charger leads to the battery terminals.
4. Never operate the generator on an uncontrolled open circuit. Make absolutely certain all connections in the circuit are secure.
5. Do not short across or ground any of the terminals on the generator or regulator.
6. Do not attempt to polarize the generator.
7. Do not disconnect lead at generator without first disconnecting battery ground cable.

Trouble in the A.C. charging system will usually be indicated by one or more of the following conditions:

1. Faulty indicator lamp operation.
2. An undercharged battery (usually evidenced by slow cranking speeds).
3. An overcharged battery (usually evidenced by excessive battery water usage).
4. Excessive generator noise or vibration.

Described in this Section are a series of on-the-vehicle quick checks which are designed to assist the service technician in locating troubles within the various components of the engine electrical system. Additional checks, adjustments and overhaul procedures of these components are also described in the "Charging Systems—Service

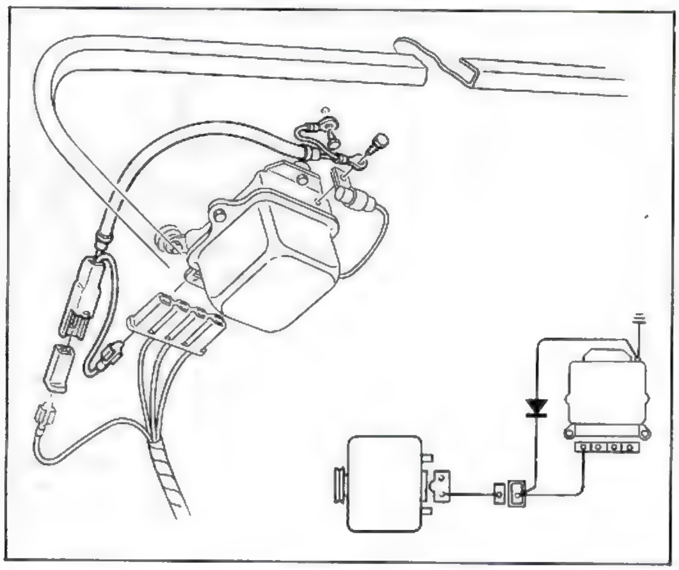


Fig. 3c—External Field Discharge Diode

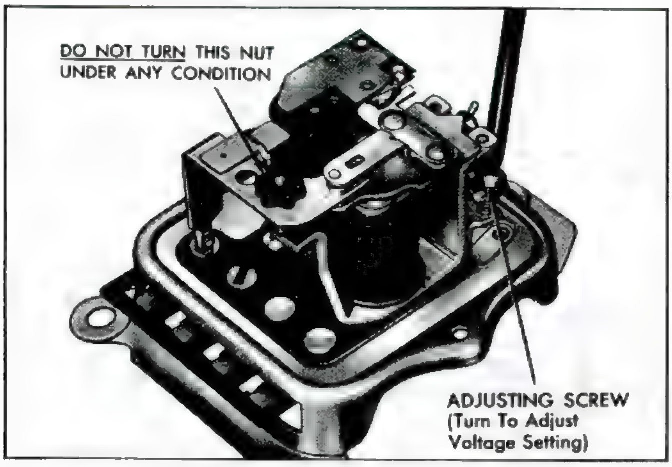


Fig. 4c—Adjust Voltage Setting

Operations Section" and should be referred to as necessary.

SYSTEM CONDITION CHECKS

STATIC CHECKS

Before making any electrical checks, perform the following static checks.

1. Check for loose or broken blower belt.
2. Check for defective battery. (Refer to Battery.)
3. Inspect all connections, including the slip-on connectors at the regulator and Delcotron.

NOTE: Do not short field to ground to check if generator is charging since this will seriously damage the charging system.

SYSTEM CONDITION TEST

This test is used to indicate the overall condition of the charging system (both good and defective) and to isolate the malfunctioning unit if the system is defective.

1. With ignition off, perform the prescribed Static Checks outlined in this section. Then set hand brake and shift transmission into neutral.
2. Connect a voltmeter from junction block on horn relay to ground at regulator base.

CAUTION: Be sure meter clip does not touch a resistor or terminal extension under regulator.

3. Connect a tachometer on engine.
4. Turn ignition switch to "ON" and check indicator lamp. If lamp fails to glow, perform appropriate tests and corrections (see Indicator Lamp Circuit tests) before continuing test.
5. If lamp glows, start the engine and run it at 1500 rpm or above. Check indicator lamp. If lamp fails to go out, perform appropriate test and corrections (see Indicator Lamp Circuit tests) before continuing test.

NOTE: At this point a field circuit has been established and any other problem will lie in generator or regulator.

6. Turn on high-beam headlights and heater blower motor to high speed, run engine at or above 1500 rpm (for a few minutes, if necessary) and read the voltage on meter.

NOTE: Voltage will not greatly exceed 12-1/2 volts until the battery develops a surface charge, a few minutes generally, unless the battery is severely discharged or is hot.

If reading is:

a. 12-1/2 volts or more, turn off electrical loads, stop engine and proceed to Step 7.
b. Less than 12-1/2 volts, perform "Delcotron Output Test—Voltmeter Method".
   1. Delcotron tests bad—refer to "Service Operations" and repair Delcotron, then repeat Step 6.
   2. Delcotron tests good—disconnect regulator connector, remove regulator cover and reconnect the connector. Then repeat Step 6 and

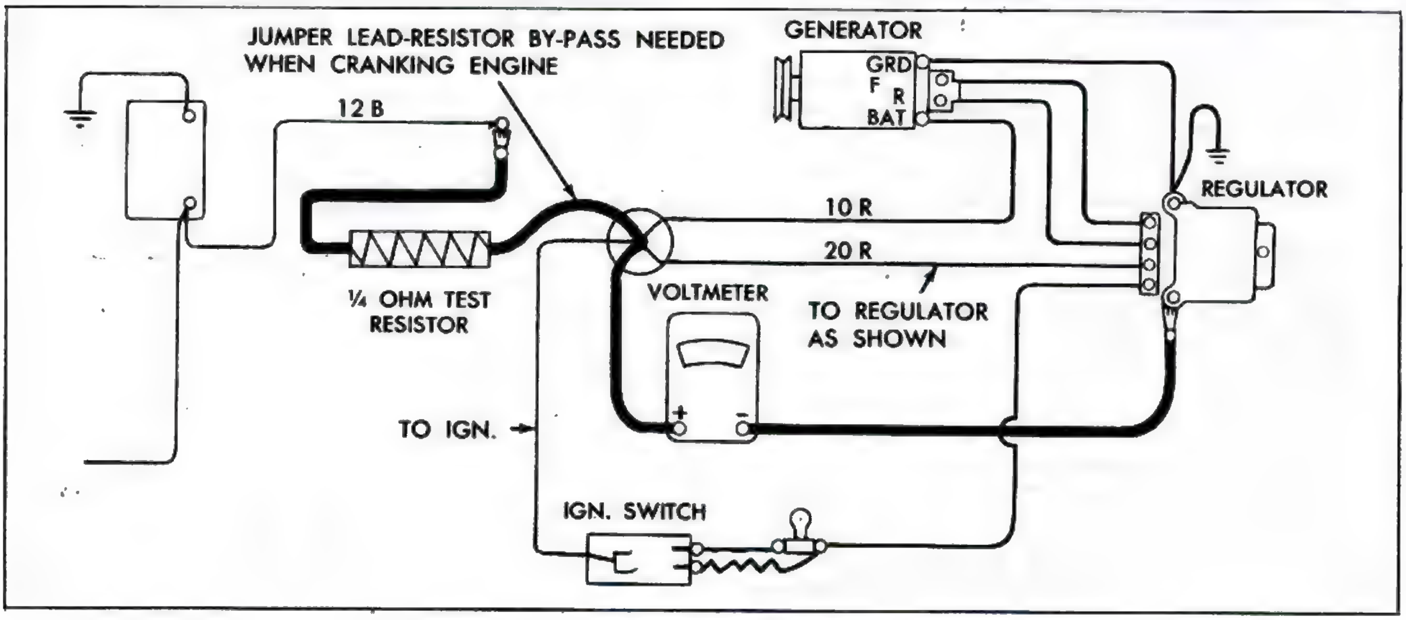


Fig. 5c—Voltage Setting Test Connections

turn voltage adjusting screw (fig. 4c) to raise setting to 12-1/2 volts. Turn off loads, stop engine and proceed to Step 7. If 12-1/2 volts cannot be obtained, install a new regulator and repeat Step 6.

7. Connect a 1/4 ohm-25 watt fixed resistor (purchased commercially) into the charging circuit at junction block as shown in Figure 5c.

NOTE: Between both leads and the terminal.

ADJUSTING REGULATOR VOLTAGE

8. Run engine at 1500 rpm or above for at least 15 minutes of warm-up, then cycle regulator voltage control (by disconnecting and re-connecting regulator connector) and read voltage.

If voltage is 13.5 to 15.2, the regulator is okay. If voltage is not within 13.5 to 15.2 volts, leave engine running at 1500 rpm or above and:

a. Disconnect four terminal connector and remove regulator cover. Then re-connect four terminal connector and adjust voltage to 14.2 to 14.6.
b. Disconnect four terminal connector and reinstall regulator cover, then reinstall connector.
c. Continue running engine at 1500 rpm for 5-10 minutes to re-establish regulator internal temperature.
d. Cycle regulator voltage by disconnecting and re-connecting regulator connector. Read voltage. A reading between 13.5 and 15.2 indicates a good regulator.

CAUTION: Be sure four terminal regulator connector is disconnected when removing or installing cover. This is to prevent regulator damage by short circuits.

DELCOTRON OUTPUT TEST (Fig. 6C)

Voltmeter Method

1. Disconnect the four-terminal connector from the regulator.
2. Disconnect the two-terminal connector from the Delcotron F and R terminals.

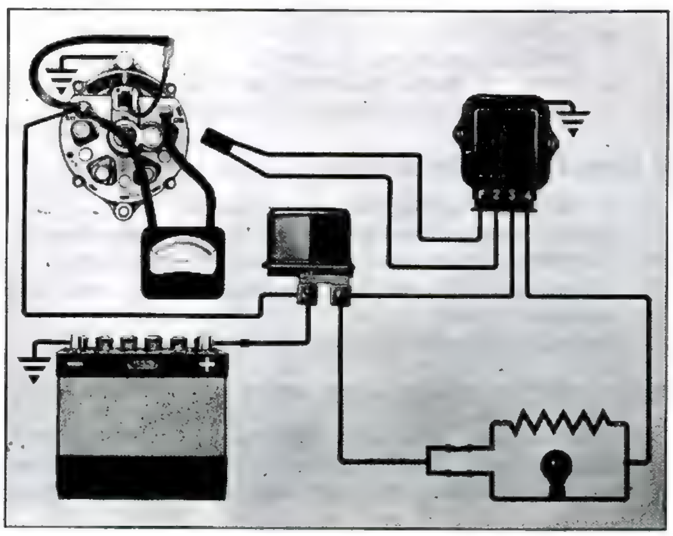


Fig. 6c—Output Test Connections (Typical)

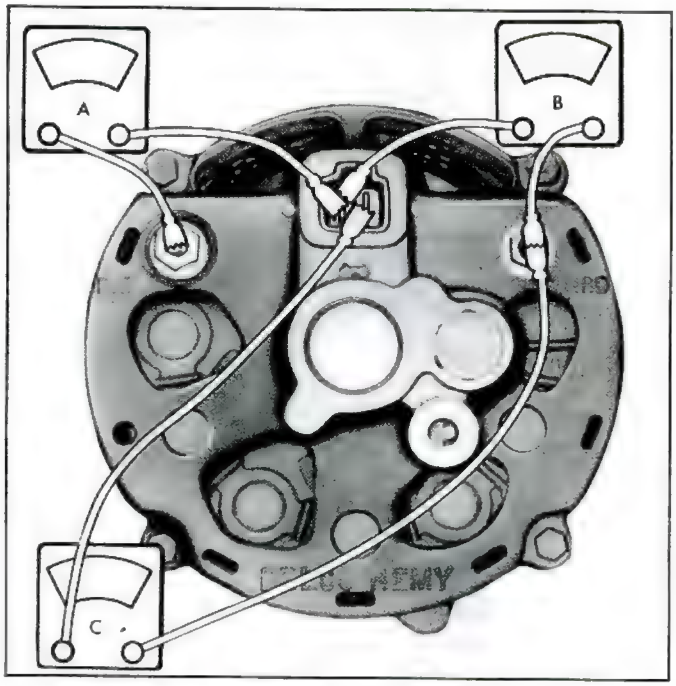


Fig. 7c—Delcotron Diode and Field Test

3. Connect a jumper wire from the Delcotron BAT terminal to the Delcotron F terminal. This provides full field excitation.
4. Connect a voltmeter from the Delcotron BAT terminal to the Delcotron GRD terminal.
5. Start engine and turn on high beam headlights and either high speed heater blower motor or medium speed on the air conditioner blower motor. Run engine 1500 rpm or above and note whether voltage exceeds 12.5 volts. If voltage exceeds 12.5 volts within a few minutes, Delcotron output is O.K. Stop engine, turn off all electrical loads, and reconnect wiring.

CAUTION: If battery is in a normal state of charge, voltage will exceed 12.5 volts as soon as engine speed in increased. Engine speed should be increased slowly to prevent voltage from exceeding 16 volts during test.

6. If voltage is less than 12.5 volts, perform other Delcotron tests and repairs outlined in Service Operations.

DELCOTRON DIODE AND FIELD TEST (Fig. 7C)

NOTE: These tests will indicate good, shorted or open field or shorted diode but will not indicate a failed open diode. If output was low and following tests show good, refer to service operations to determine cause and repair.

1. Disconnect battery ground cable at battery.
2. Positive diodes (Test A) connect an ohmmeter between "R" terminal and "BATT" terminal and note reading, then reverse the leads at same terminals and note this reading. Meter should read high resistance in one direction and low in the other.
3. Negative diodes (Test B) connect ohmmeter between "R" terminal and "GRD" and note reading, then reverse the leads and note this reading. Meter should read high in one direction and low in the other.

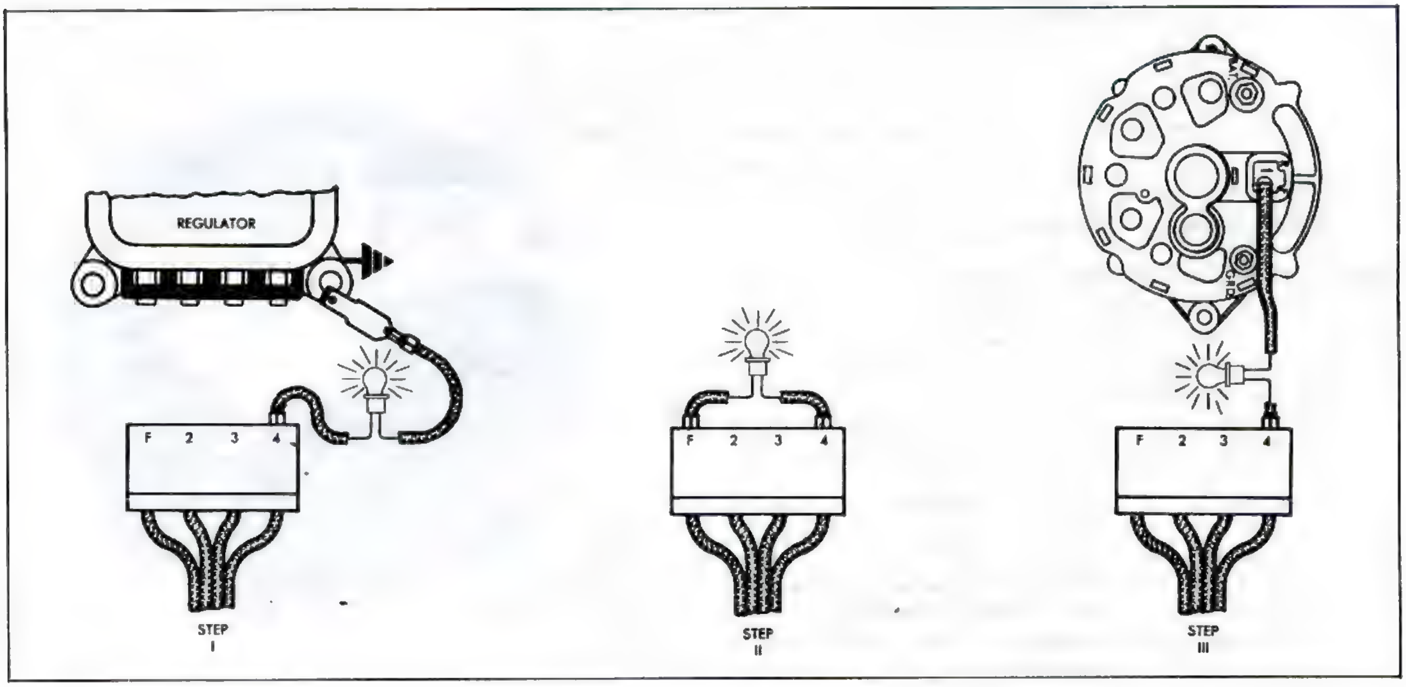


Fig. 8c—Indicator Lamp Circuit Tests

NOTE: A high or low reading in both directions indicates a defective diode.

4. Open Field Check:
   a. Connect an ohmmeter from "F" terminal to "GRD" terminal stud and note reading on the lowest range scale. Meter should read 7 to 20 ohms.
   b. If meter reads zero or excessively high resistance, the Delcotron is faulty.
5. If above tests indicate a defective Delcotron, remove and completely check Delcotron as outlined under "Service Operations".

INDICATOR LAMP CIRCUIT TESTS

The indicator lamp circuit (fig. 8c) provides initial field excitation (causing lamp to glow). The light is cancelled by closing the field relay which applies battery voltage to both sides of bulb (bulb goes out).

The indicator light should glow when ignition switch is "ON" and go out almost immediately when engine starts.

If Lamp Fails to Glow the Possible Causes Are:

1. Faulty bulb.
2. Faulty bulb socket.
3. An open circuit in wiring, regulator, or field.
4. A shorted positive diode—(may also cause glow with ignition switch "OFF").

Test as Follows:

1. Disconnect connector from regulator and connect a jumper lead from connector terminal "4" to ground (fig. 8c, Step 1). Turn ignition switch to "ON" momentarily and note indicator lamp:
   a. Lamp fails to glow—check for faulty bulb, socket or open circuit between switch and regulator connector. Repair as needed.
   b. Light goes on—failure is in regulator, Delcotron or wire between "F" terminals on regulator and Delcotron. Go to Step 2.
2. Disconnect jumper lead at ground end and connect between connect "F" and "4" terminals, (fig. 8c, Step 2) then turn switch to "ON" momentarily and note lamp:
   a. Lamp glows—problem is in regulator. An open circuit in regulator or relay is stuck closed. See "Service Operations" for repair.
   b. Fails to glow—problem is in wire between "F" terminals on generator and regulator or in field windings. Go to Step 3.
3. Disconnect jumper at connector "F" terminal and connect "F" terminal on Delcotron (fig. 8c, Step 3), then turn switch on momentarily and note lamp:
   a. Lamp glows—an open circuit in wire between "F" terminals—correct as needed.
   b. Fails to glow—Delcotron field has open circuit, see "Service Operations" to repair.

If Lamp Fails to Go Out the Possible Causes Are:

1. Loose drive belt—adjust as necessary.
2. Faulty field relay—(see relay test and adjustment).
3. Defective Delcotron—(see Delcotron output test).
4. At normal idle—parallel resistance wire open (see Resistance test).
5. Switch off—positive diode shorted (see Diode test).

FIELD CIRCUIT RESISTANCE WIRE TESTS

The resistance wire is an integral part of the ignition harness. However, the resistance wire is not solderable; it must be spliced with a crimp-type connector. It is rated at 10 ohms, 6.25 watts minimum.

The check for an open resistor (connected to the ignition switch "ACC" terminal) is as follows:

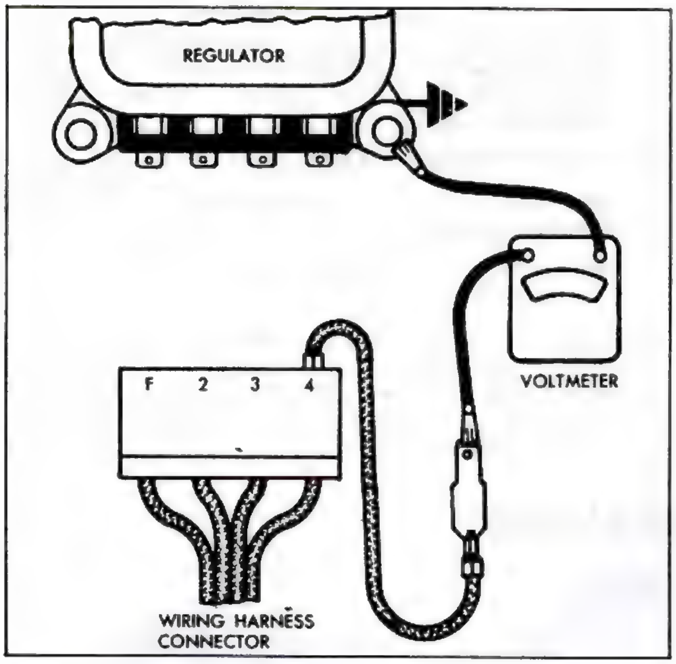


Fig. 9c—Circuit Resistance Wire Test

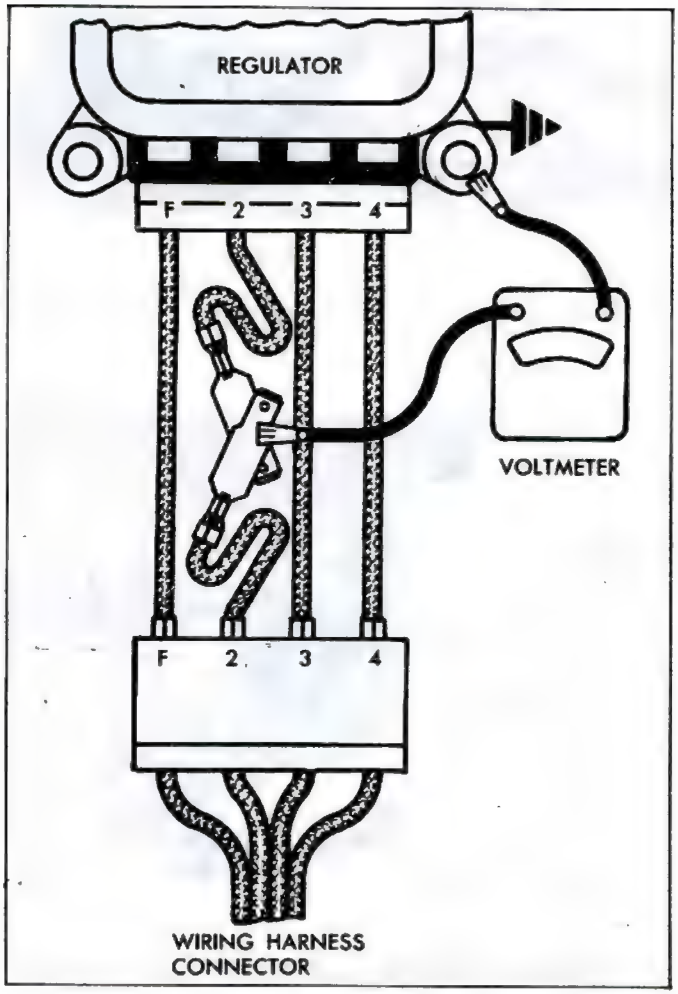


Fig. 10c—Checking Field Relay

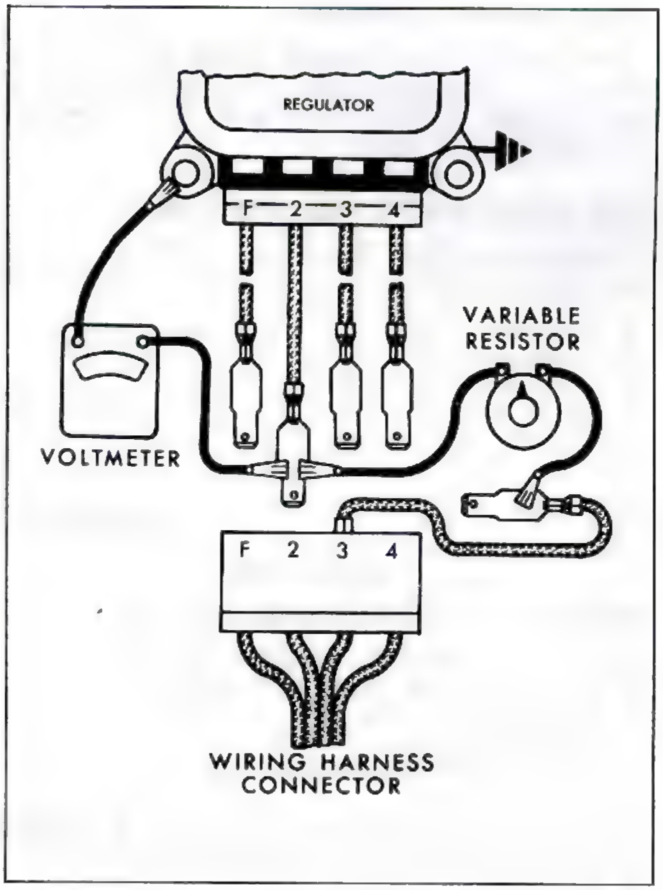


Fig. 11c—Checking Field Relay Closing Voltage

1. Connect a test lamp from the wiring harness connector terminal to ground as shown in Figure 9c (Step 1).
2. Turn the ignition switch to the "ON" position and note test bulb.
3. If the test lamp does not glow, the resistor is open.

NOTE: The telltale lamp does not glow during this test because series resistance of the 2 bulbs causes amperage to be low.

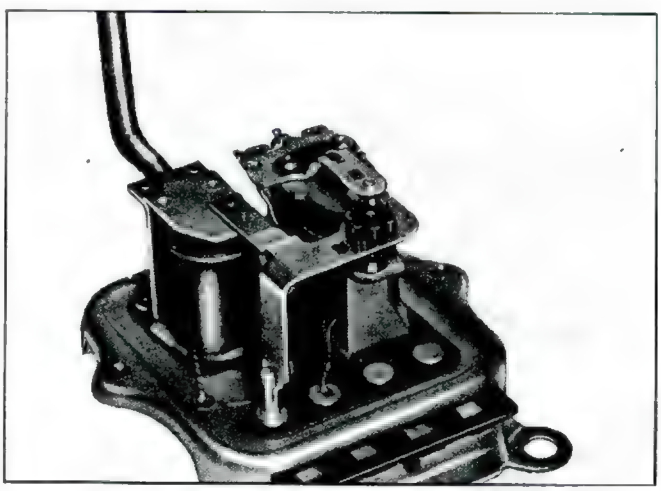


Fig. 12c—Adjusting Field Relay Closing Voltage

OTHER HARNESS CHECKS

Other wires in the charging system harness need be checked for continuity by use of an ohmmeter or a test light (12 Volt). Connect the test so the wire in question is in series in the test circuit.

FIELD RELAY CHECKS AND ADJUSTMENT

To check for a faulty relay proceed as follows:

1. Connect a voltmeter into the system at the regulator No. 2 terminal to ground (fig. 10c).
2. Operate the engine at fast idle (1500 to 2000 rpm) and observe voltmeter reading.
3. If voltmeter shows zero voltage at regulator, check circuit between No. 2 terminal on regulator to "R" terminal on Delcotron.
4. If voltage at regulator exceeds closing voltage specification and light remains on, regulator field relay is faulty. (Refer to specifications at the end of this section.) Check and adjust regulator as outlined under "Closing Voltage Adjustment".

CLOSING VOLTAGE ADJUSTMENT

1. Make connections as shown in Figure 11c using a 50 ohm variable resistor.

   NOTE: This provides a variable resistance from a hot lead to the relay coil.

2. Turn resistor to "open" position.
3. Turn ignition switch off.
4. Slowly decrease resistance and note closing voltage of the relay. Adjust by bending heel iron in the manner illustrated in Figure 12c.

SERVICE OPERATIONS

GENERATOR

REMOVAL AND INSTALLATION (Fig. 13C)

1. Disconnect battery ground cable at battery.
2. Disconnect wiring leads at Delcotron.
3. Remove blower belt from Delcotron pulley as described in Section 6, Tune-up.
4. Remove three attaching bolts and remove Delcotron from vehicle.
5. To install Delcotron, position unit to mounting bracket and brace and install attaching bolts.
6. Install and adjust blower belt as outlined in Section 6, Tune-up.
7. Connect wiring harness to rear of Delcotron.
8. Connect battery ground cable at battery and check operation of unit.

PULLEY REPLACEMENT

Single Groove Pulley

1. Place 15/16" box wrench on retaining nut and insert a 5/16" allen wrench into shaft to hold shaft while removing nut (fig. 14c).
2. Remove washer and slide pulley from shaft.
3. To install, slide washer and pulley onto shaft and tighten self locking retaining nut.

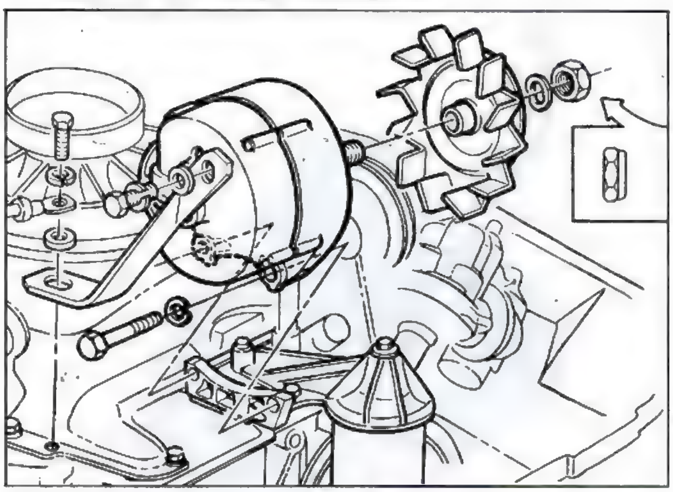


Fig. 13c—Delcotron Assembly

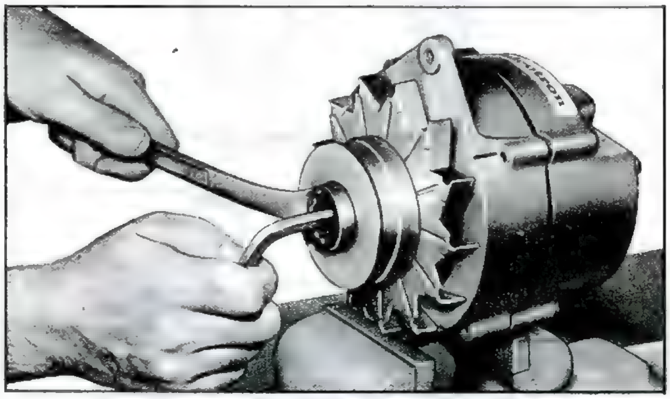


Fig. 14c—Pulley Removal

4. Using a torque wrench with a crow-foot adapter (instead of a box wrench), torque the nut 50 to 60 ft. lbs. (fig. 15c).

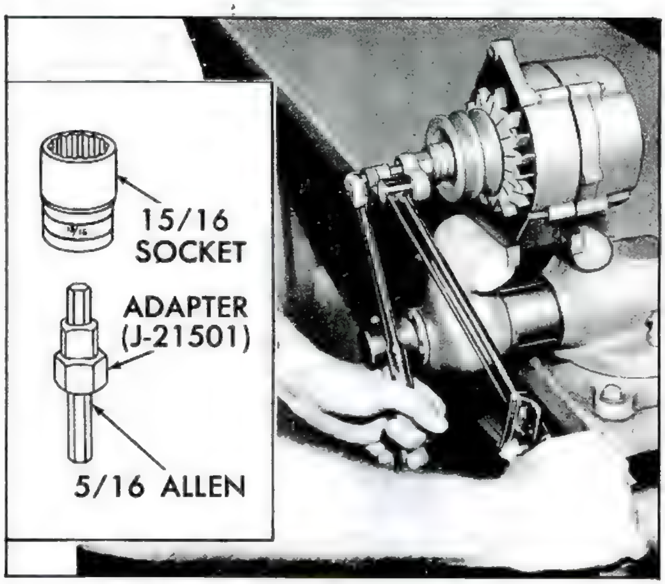


Fig. 15c—Torquing Pulley Nut

NOTE: Be sure wave washer is completely depressed.

DISASSEMBLY

1. Hold generator in a vise, clamping the mounting flange lengthwise.
2. Remove 4 thru bolts then break loose the end frames by prying at bolt locations.
3. Remove the slip-ring end frame and stator (as an assembly) from drive end and rotor assembly.
4. Place a piece of tape over the slip ring end frame bearing to prevent entry of dirt or other foreign matter.

   CAUTION: Brushes may drop onto rotor shaft and become contaminated with bearing lubricant. Clean brushes prior to installing with a non-toxic cleaner such as tri-chlorethylene.

5. Remove the three stator lead attaching nuts and separate stator from end frame.
6. Remove brush holder screws and brush holder assembly.
7. Remove heat sink from end frame by removing "batt" and "grd" terminals and one attaching screw (fig. 20c).
8. Remove slip ring end frame bearing (if necessary) by removing inner seal and slide.
9. Remove drive pulley as outlined previously, then remove rotor and spacers from end frame assembly.
10. Remove drive end frame bearing retainer plate and bearing assembly from frame.

CLEANING AND INSPECTION

With generator completely disassembled, except for removal of diodes, the components should be cleaned and inspected. Be sure testing equipment is in good working order before attempting to check the generator.

1. Wash all metal parts except stator and rotor assemblies.

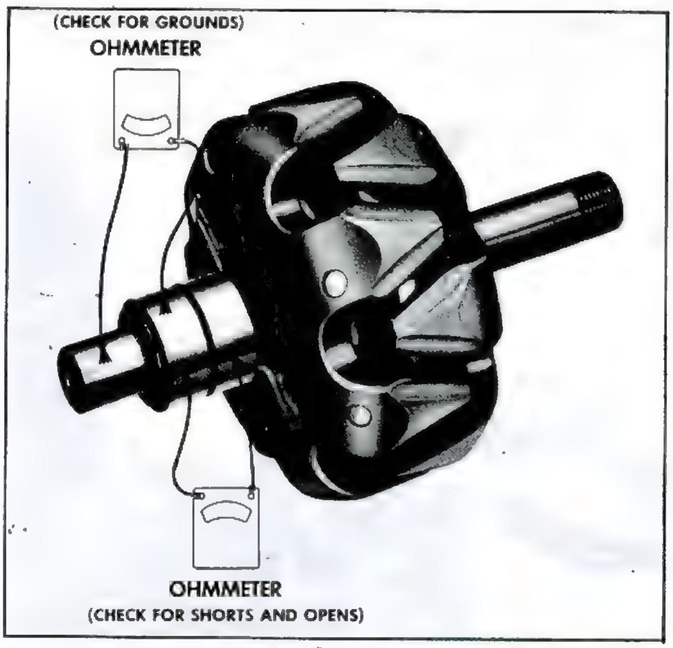


Fig. 16c—Checking Rotor for Grounds or Opens

2. Clean bearings and inspect for sealing, pitting or roughness.
3. Inspect rotor slip rings, they may be cleaned with 400 grain polishing cloth. Rotate rotor for this operation to prevent creating flat spots on slip rings.
4. Slip rings which are out of round may be trued in a lathe to .001" maximum indicator reading. Remove only enough material to make the rings smooth and concentric. Finish with 400 grain polishing cloth and blow dry.
5. Slip rings are not replaceable—excessive damage will require rotor assembly replacement.
6. Inspect brushes for wear. If they are worn halfway, replace. Inspect brush springs for distortion or weakening. If brushes appear satisfactory and move freely in brush holder, springs may be reused.

TESTING ROTOR

The rotor may be checked electrically with a 110-volt test lamp or an ohmmeter.

Grounds

Connect test lamp or ohmmeter from either slip ring to the rotor shaft or to the rotor poles. If the lamp lights or if the ohmmeter reading is low, the field windings are grounded (fig. 16c).

Opens

Connect one test lamp or ohmmeter lead to each slip ring. If the lamp fails to light or if the ohmmeter reading is high, the windings are open (fig. 16c).

Short Circuits

The windings are checked for shorts by connecting a 12 volt battery and an ammeter in series with the two slip rings. Note the ammeter reading. An ammeter reading above the specified field amperage draw indicates shorted windings. Refer to Specifications at the end of this section.

TESTING STATOR

Grounds

Connect a 110-volt test lamp or an ohmmeter from any stator lead to the stator frame. If test lamp lights or if ohmmeter reads low, the windings are grounded (fig. 17c).

Opens

If lamp fails to light or if ohmmeter reads high when successively connected between each pair of stator leads, the windings are open (fig. 17c).

Short Circuits

A short in the stator windings is difficult to locate without special test equipment due to the low resistance of the windings. However, if all other electrical checks are normal and the generator fails to supply rated output, shorted windings are indicated. Sometimes, a shorted winding will show evidence of charring.

TESTING DIODES

Two methods may be used to check diodes for shorts

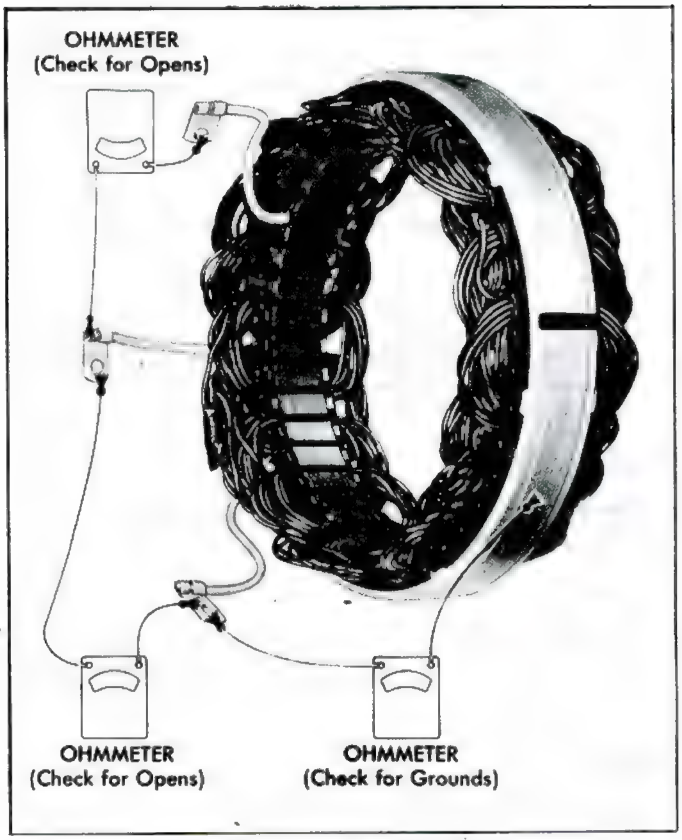


Fig. 17c—Checking Stator for Grounds or Opens

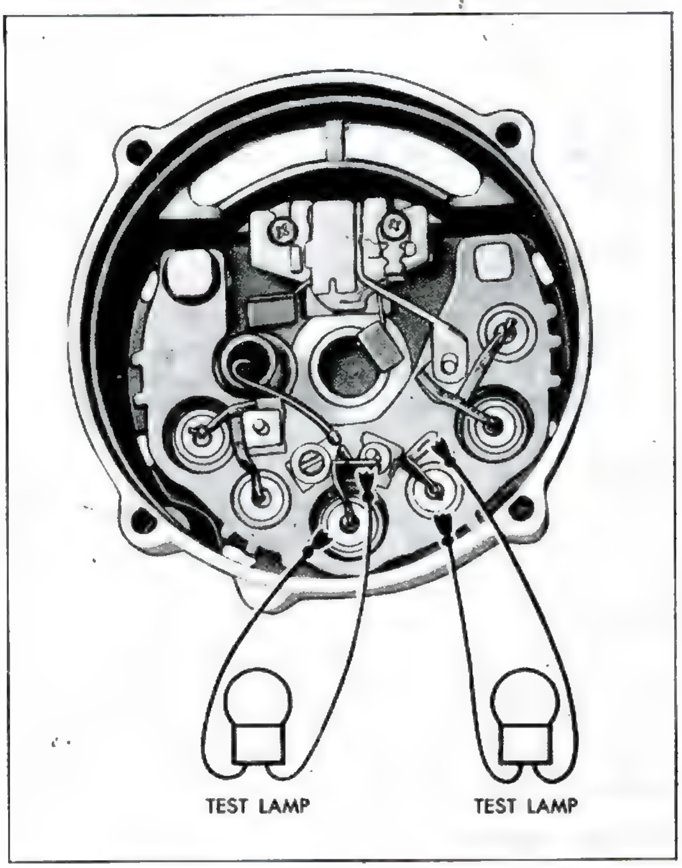


Fig. 18c—Checking Diodes

or opens, a test lamp of not more than 12 volts or an ohmmeter.

CAUTION: Do not use a 110-volt test lamp to test diodes.

Test Lamp Method

Diode in Heat Sink

With the stator previously disconnected, connect one of the lamp leads to the heat sink and other lead to the diode lead (fig. 18c). Observe condition of lamp. Reverse the lamp leads and observe condition of lamp. A good diode will allow the lamp to light in only one of the test directions. If lamp lights in both directions or fails to light at all, the diode is defective.

Diode in the End Frame

Connect one lamp lead to the end frame and the other lamp lead to the diode lead (fig. 18c), and observe lamp condition. Reverse the lamp lead connections and observe the lamp condition. A good diode will allow lamp to light in only one direction. If lamp lights in both directions or fails to light at all, the diode is defective.

Ohmmeter Method

Use an ohmmeter with a 1-1/2 volt cell and use the lowest range scale.

Connect the ohmmeter leads at each diode (as previously described using a test lamp) first in one direction and then the other (fig. 18c). Note the readings. If both readings are identical (very high or very low), the diode is defective. A good diode will give one high and one low reading.

REPAIRS

Diode Replacement

1. Support end frame with support Tool J-9717-2 and press out diode with diode removal Tool J-9717-1 and an arbor press (fig. 19c).

CAUTION: Do not strike diode as shock may damage other diodes.

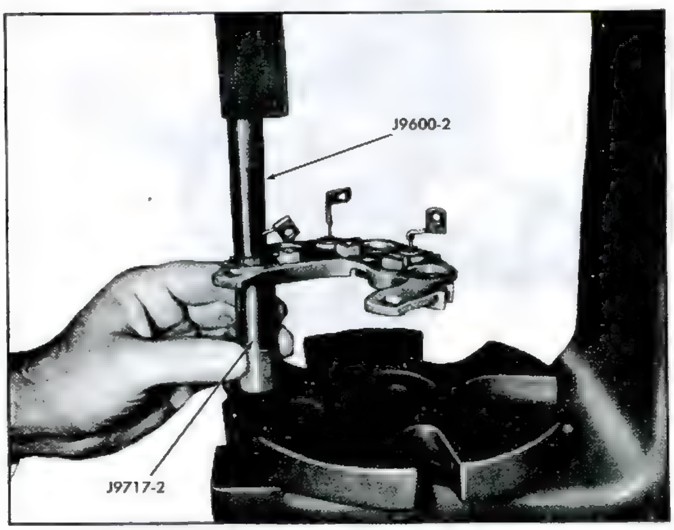


Fig. 19c—Installing Diodes with Press Tools

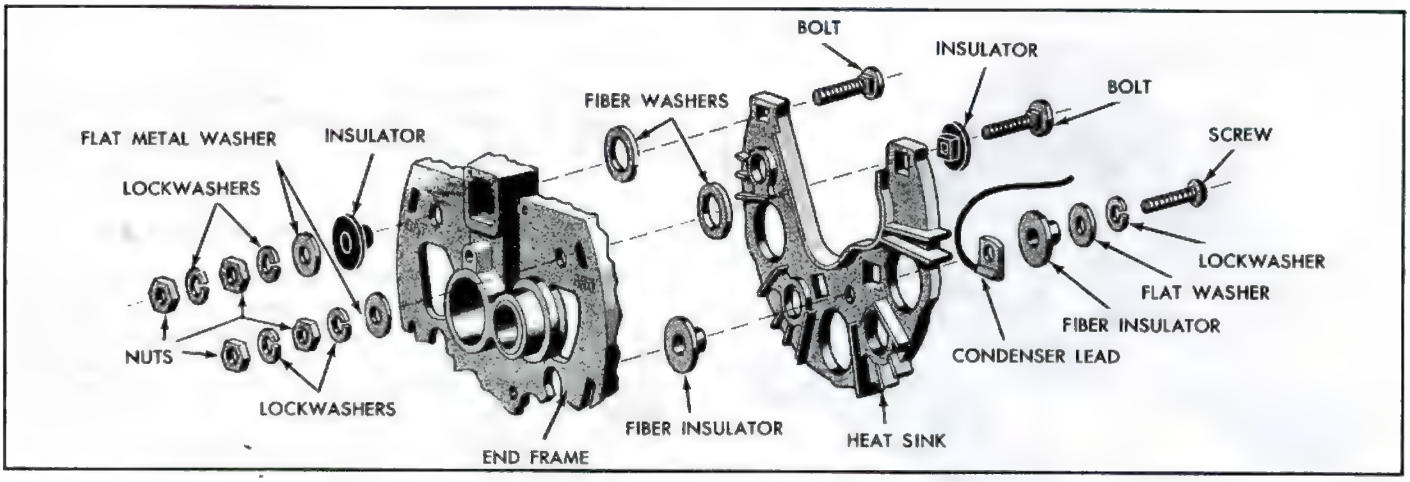


Fig. 20c—Heat Sink—Parts Location

2. Select diode with proper color marking.

   NOTE: Diodes in the heat sink are positive (red markings) and those in the end frame are negative (black markings).

3. Support outside end of frame around diode hole on a flat, smooth surface and press diode into position with J-9600-2 and an arbor press. Make sure diode is square with end frame and started straight (fig. 19c).

   CAUTION: Avoid bending or moving diode stem as excessive movement can cause internal damage and result in diode failure.

Heat Sink Replacement

1. Detach heat sink from end frame by removing the two terminal bolts. Note carefully the proper stack-up of parts so that the "BAT" and "GRD" terminal bolts can be reassembled in the same manner (fig. 20c).
2. Replace diodes, if necessary, as outlined in Diode Replacement.
3. Assemble heat sink to the end frame, following carefully the proper stack-up of parts as noted in Step 1.

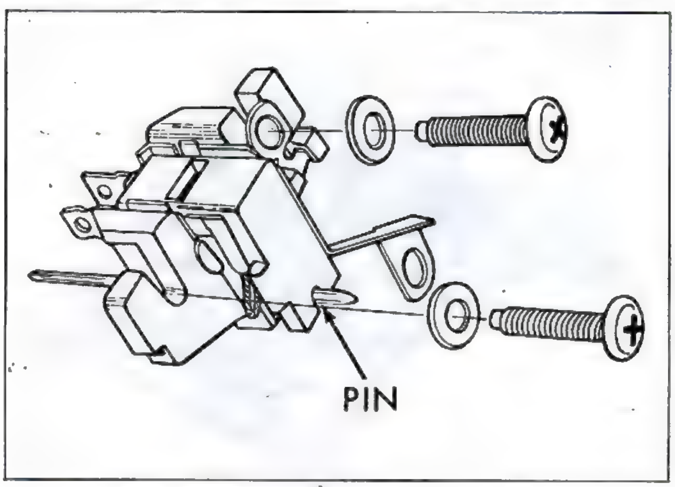


Fig. 21c—Brush Assembly—5.5" Delcotron

Brush Replacement

5.5" Delcotron—Fig. 21C

1. After through bolt removal and Delcotron separation, remove stator lead nut that also holds relay terminal connector.
2. Remove 2 mounting screws and brush holder assembly.
3. Position new brush holder assembly and install retaining screws.
4. Connect relay terminal wire lead and install stator lead nut.

End Frame Replacement

1. Remove heat sink as outlined in Heat Sink Replacement.
2. Attach brush holder assembly to the new end frame noting carefully proper parts stack-up (fig. 22c) and insert pin or wire through the hole to hold the brushes in the holder. After the unit has been completely assembled, withdraw the pin or wire from the end frame hole to allow the brushes drop down onto the slip rings.

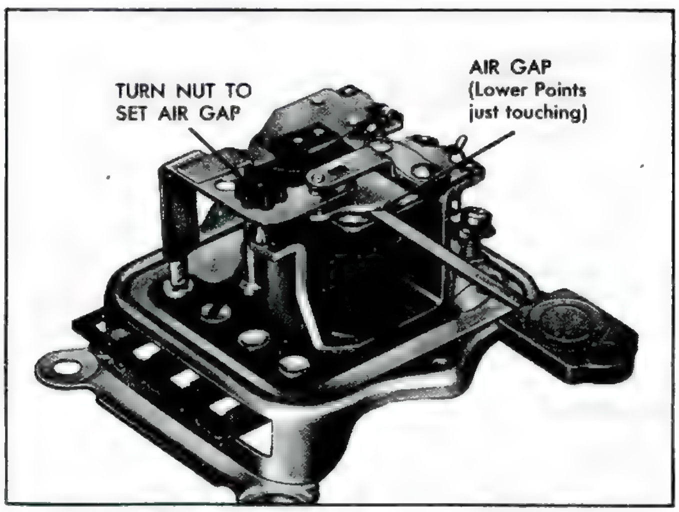


Fig. 22c—Checking Voltage Regulator Air Gap

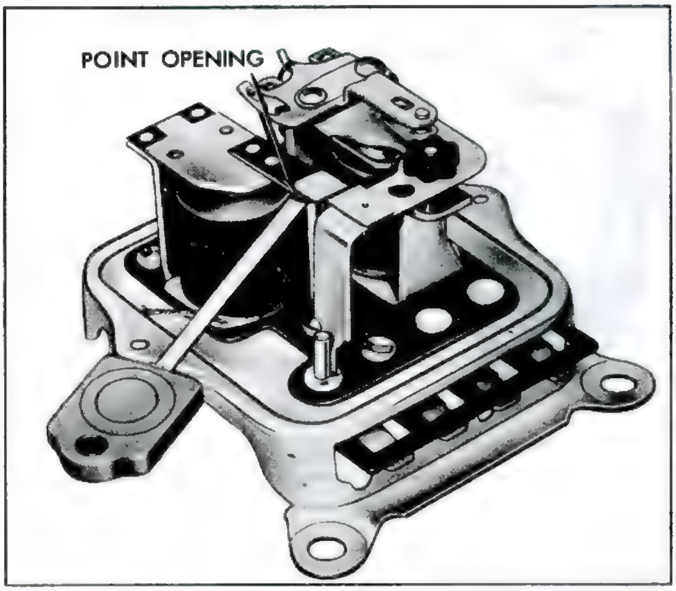


Fig. 23c—Checking Field Relay Point Opening

3. Replace heat sinks to end frame as outlined in Heat Sink Replacement.

Bearing Replacement—Drive End Frame

1. The drive end frame bearing can be removed by detaching the retainer plate bolts and separating retainer plate from end frame, and then pressing bearing out using suitable tube or pipe on outer race.

   NOTE: 5.5" Delcotron uses staked retainer plate bolts.

2. Refill bearing one-quarter full with Delco-Remy No. 1948791 grease or equivalent. Do not overfill.
3. Press bearing into end frame using tube or pipe as in Step 1.
4. Install retainer plate and bolts. Stake bolts to retainer plate. Use new retainer plate if felt seal is hardened or excessively worn.

Bearing Replacement—Slip Ring End Frame

5.5" Delcotron

1. Replace the bearing if the grease supply is exhausted. Make no attempt to re-lubricate and reuse the bearing.
2. Press out from inside of housing, using suitable tool over outer race of bearing.
3. To install, place a flat plate over the bearing and press in from outside of housing until bearing is flush with the outside of the end frame. Support inside of end frame around bearing bore with a suitable tool to prevent distortion. Use extreme care to avoid misalignment.

ASSEMBLY

5.5" Delcotron

1. Install stator assembly in slip ring end frame and locate diode connectors over the relay, diode and stator leads, and tighten terminal nuts.
2. Install the front end frame over rotor.
3. Install fan, spacer, pulley washer and nut.
4. Place torque wrench and Adapter J-21501 on shaft nut and insert allen wrench into opening at end of drive shaft. Tighten one lock shaft nut to 50-60 ft. lbs. (fig. 15c).

DOUBLE CONTACT REGULAR

While most regular adjustments are made on the vehicle as outlined under "Maintenance and Adjustments", the regulator may be removed for field relay point air gap adjustment. However, voltage regulating contacts should never be cleaned as they are made of special material that may be destroyed by cleaning with any abrasive material.

NOTE: A sooty or discolored condition of the contacts is normal after a relatively short period of operation.

REMOVAL AND INSTALLATION

To remove the regulator assembly, disconnect the battery ground cable and the wiring harness connector at the regulator then remove the screws securing the regulator to the vehicle. Reverse removal to install.

MECHANICAL ADJUSTMENTS

Electrical settings must be checked and adjusted after making mechanical adjustments. Before installing regulator cover, make sure the rubber gasket is in place on the regulator base.

Voltage Regulator Adjustment

Air Gap: Measure the air gap with a feeler gauge placed between the armature and core when the lower contacts are touching as shown in Figure 22C. To adjust the air gap, turn the nylon nut located on the contact support.

NOTE: Only an approximate voltage regulator air gap setting need be made by the "feeler gauge" method.

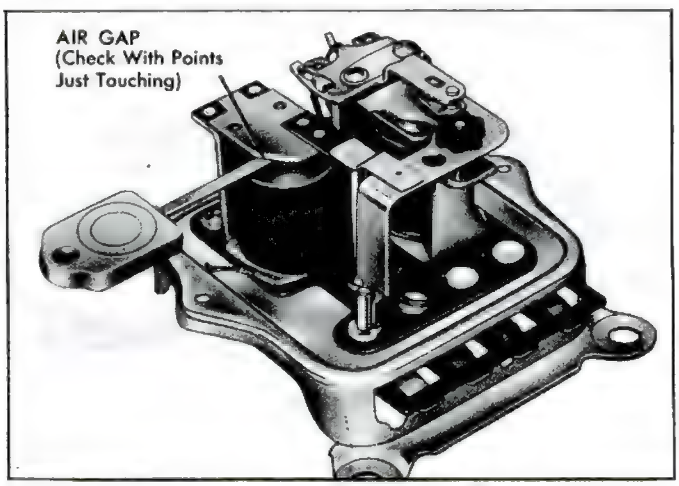


Fig. 24c—Checking Field Relay Air Gap

Field Relay Adjustment

1. Point Opening: The point opening is checked as illustrated in Figure 23c. If adjustment is necessary, carefully bend the armature stop.
2. Air Gap: Check the air gap with the points just touching (fig. 24c). The air gap normally need not be adjusted. If the point opening and closing voltages are within specifications, the relay will operate satisfactorily even though the air gap may not be exactly according to specifications. If adjustment is necessary, carefully bend the flat contact spring.

IGNITION SYSTEM

INDEX

GENERAL DESCRIPTION

The distributor and spark plugs are the only ignition system components that require periodic service. The remainder of the ignition system requires only periodic inspection to check operation of the units, tightness of the electrical connections, and condition of the wiring. When checking the coil, test with a reputable tester.

Distributors are equipped with a cam lubricator and should have the lubricator replaced at the same time the contact point set is replaced. It is not necessary to lubricate the breaker cam when using a cam lubricator however, the breaker cam should be wiped clean and lightly lubricated when installing a new lubricator. Do not attempt to lubricate the element - Replace when necessary. When installing a new lubricator, adjust its position so the circumference of the lubricator just touches the lobe of the breaker cam.

Distributor shaft lubrication is accomplished by a reservoir of lube around the mainshaft in the distributor body.

The distributor used on the turbo-supercharged engines is different from other engine model distributors in that a pressure retard unit replaces the ordinary advance unit. This unit retards the spark during the time the manifold is pressurized, partially opposing centrifugal advance at high engine rpm. The curve is as shown in Figure 1i.

Service operations are the same as on regulator distributor except for those operations relating to the vacuum advance unit.

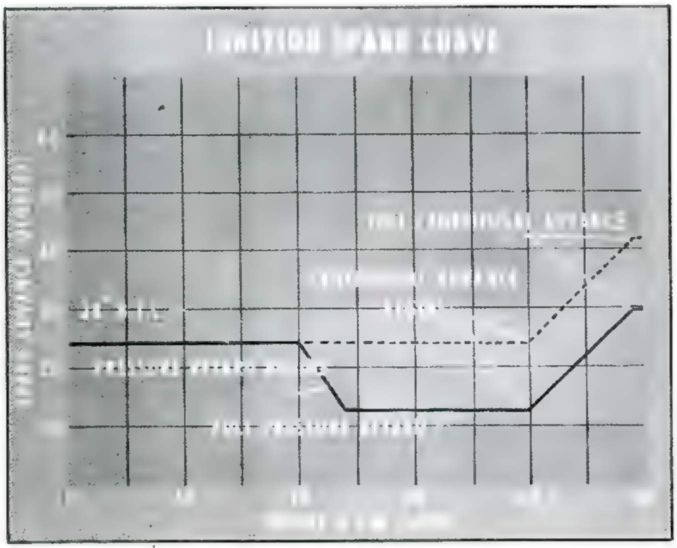


Fig. 1i—Distributor Spark Curve

Spark plugs - should be removed, inspected cleaned and regapped at tune-up. Defective plugs should be replaced, see Servicing of Units Off the Vehicle.

MAINTENANCE AND ADJUSTMENT

CONTACT POINT REPLACEMENT

Refer to Figures 2i through 4i

1. Release distributor cap hold-down screws, remove cap and place it out of work area.
2. Remove rotor and dust shield.
3. Pull primary and condenser lead wires from contact point quick-disconnect terminal (fig. 2i).
4. Remove contact set attaching screw, lift contact point set from breaker plate (fig. 2i).
5. Clean breaker plate of oil smudge and dirt.
6. Place new contact point assembly in position on breaker plate, install attaching screw.

CAUTION: Carefully wipe protective film from point set prior to installation.

NOTE: Pilot on contact set must engage notching hole in breaker plate.

7. Connect primary and condenser lead wires to quick disconnect terminal on contact point set.
8. Check and adjust points for proper alignment and breaker arm spring tension (fig. 3i). Use an aligning tool to bend stationary contact support if points need alignment.
9. Set point opening (.019" for new points) (fig. 4i).
10. Rotate cam lubricator 90° (fig. 2i).

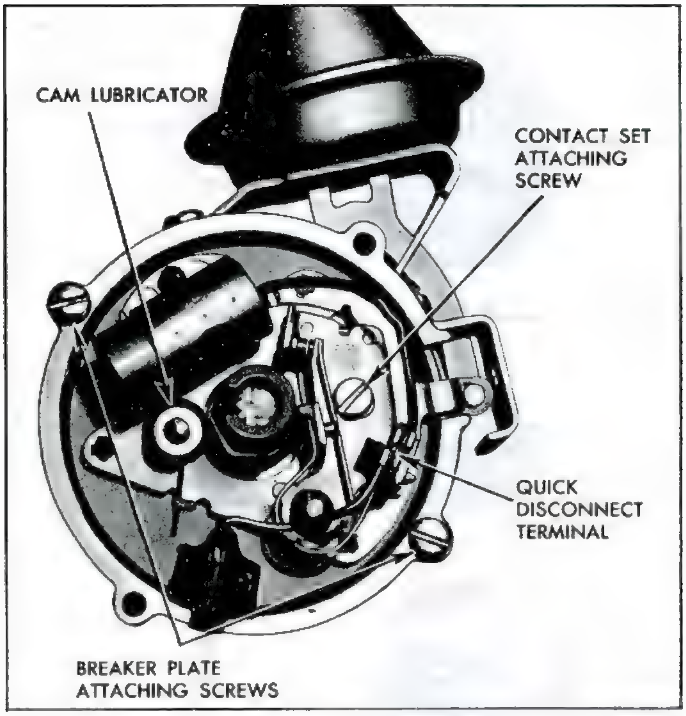


Fig. 2i—Breaker Plate and Attaching Parts

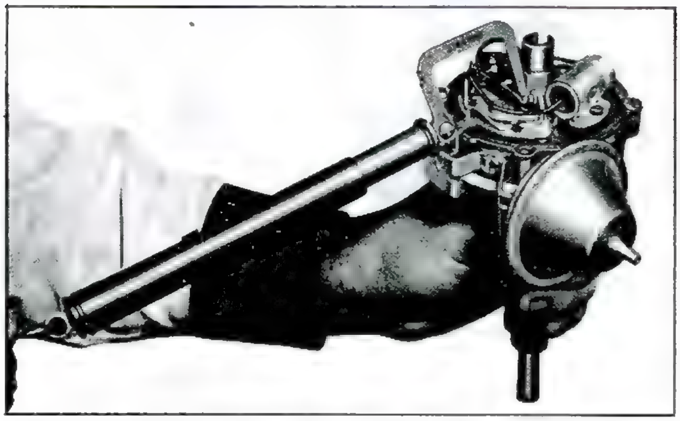


Fig. 3i—Checking Breaker Arm Spring Tension

11. Reinstall dust shield, rotor, position and lock distributor cap to housing.
12. Check and set ignition timing. (See Engine Tune-Up, Section 7.)

CONDENSER REPLACEMENT

Refer to Figure 2i

1. Release distributor cap hold-down screws, remove cap and place it out of work area.
2. Remove rotor and dust shield.
3. Disconnect condenser lead wire from contact point quick disconnect terminal.
4. Remove condenser attaching screw, lift condenser from breaker plate. Wipe breaker plate clean.
5. Install new condenser using reverse of procedure outlined above.

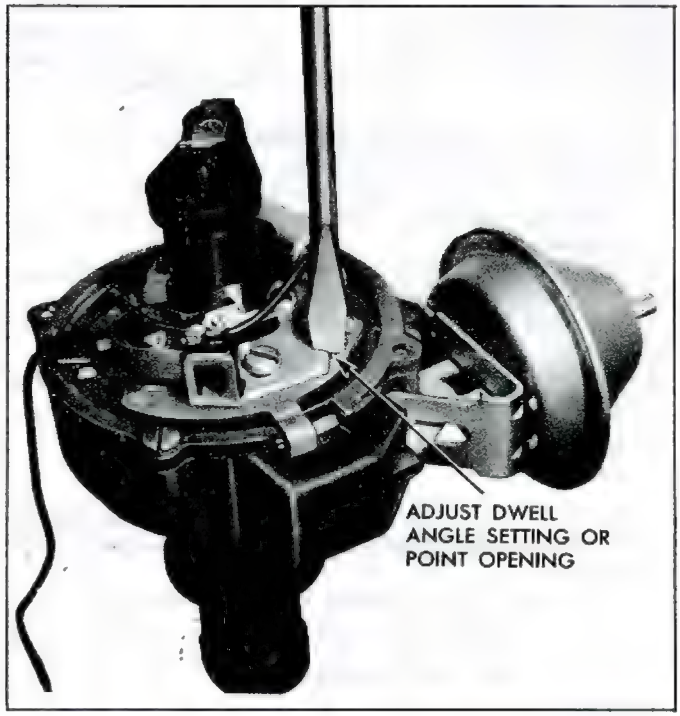


Fig. 4i—Setting Point Opening

SERVICE OPERATIONS

DISTRIBUTOR

REMOVAL

1. Release distributor cap hold-down screws, remove cap and place it out of work area.

   NOTE: If necessary to remove secondary leads from distributor cap, mark position on cap tower for lead to No. 1 cylinder. This will aid in reinstallation of leads in cap.
2. Disconnect distributor primary lead from coil terminal.
3. Scratch a realignment mark on distributor in line with rotor segment (fig. 2i).
4. Disconnect vacuum line from vacuum control assembly (retard unit on turbo-charged engines), remove distributor hold-down bolt and clamp, remove distributor from engine. Note position of vacuum advance assembly relative to engine for correct reinstallation (fig. 5i).

CAUTION: Avoid rotating engine with distributor removed as ignition timing will be upset.

DISASSEMBLY

With the distributor removed from vehicle it is advisable to place it in a distributor testing machine or synchroscope.

CAUTION: When mounting the distributor in any distributor testing machine or synchroscope, extreme care must be taken not to score or otherwise damage the lower distributor shaft with the testing machine drive mechanism. A protective adapter, with bushing, available from the manufacturers of such testing machines for use with the Corvair distributor, must be used over the lower 1-3/8" of the distributor shaft.

Test the distributor for variation of spark, correct centrifugal and vacuum advance and condition of contacts. This test will give valuable information on distributor condition and indicate parts replacement which may be necessary. Check area on breaker plate just beneath breaker points. A smudgy line indicates that oil or crankcase vapors have been present between points.

Refer to Figure 6i for exploded view of distributor.

1. Remove rotor and dust shield.
2. Remove vacuum control assembly linkage cover and retaining screws, remove unit from distributor housing.
3. Disconnect primary and condenser leads from contact point quick disconnect terminal, remove contact point set attaching screw, condenser attaching screw, remove point set and condenser from breaker plate.
4. Remove breaker plate attaching screws, remove breaker plate from distributor housing (fig. 2i).

   NOTE: Do not disassemble breaker plate any further.

5. Remove roll pins retaining driven gear and thrust washers to mainshaft, slide gear and washers from shaft.
6. Slide cam and mainshaft from distributor housing.
7. Remove weight cover and stop plate screws, remove cover, weight springs, weights, and slide cam assembly from mainshaft.

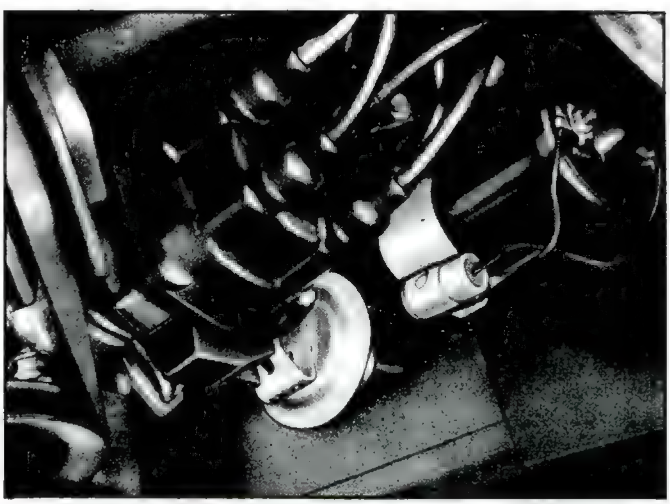


Fig. 5i—Distributor Installed

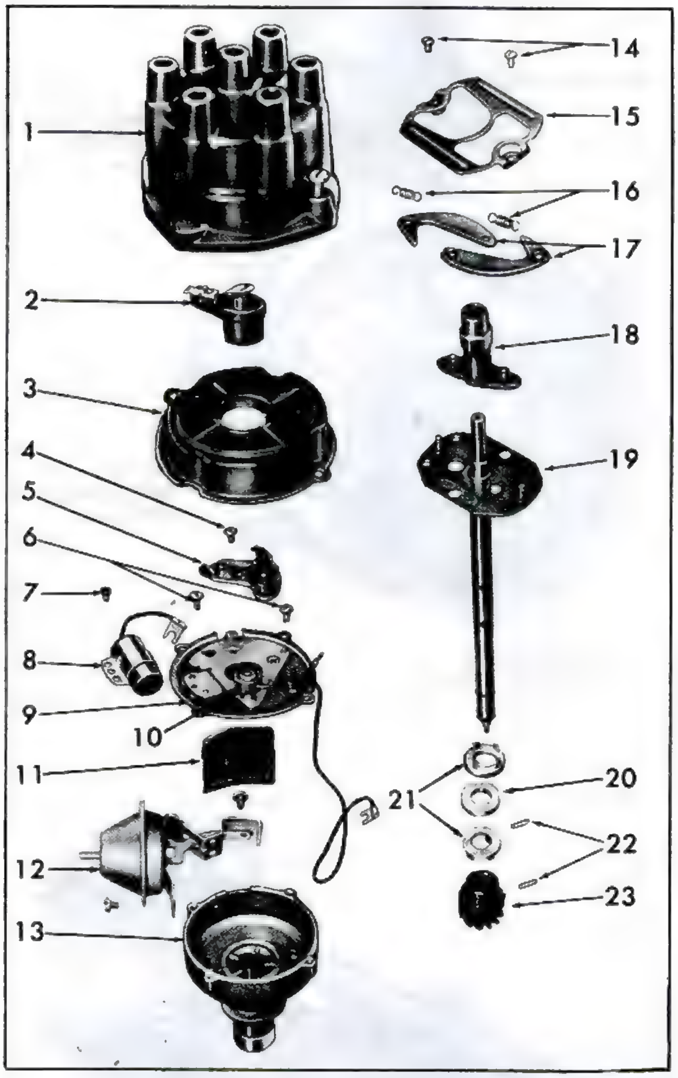


Fig. 6i—Distributor Exploded View

1. Cap
2. Rotor
3. Dust Shield
4. Contact Point Attaching Screw
5. Contact Point Assembly
6. Breaker Plate Attaching Screws
7. Condenser Attaching Screw
8. Condenser
9. Breaker Plate Assembly
10. Cam Lubricator
11. Vacuum Advance Linkage Boot
12. Vacuum Control Assembly
13. Housing
14. Weight Cover Attaching Screw
15. Weight Cover
16. Weight Springs
17. Advance Weights
18. Cam Assembly
19. Mainshaft Assembly
20. Washer
21. Thrust Washers
22. Roll Pins
23. Drive Gear

CLEANING AND INSPECTION

1. Wash all parts in cleaning solvent except cap, rotor, condenser, breaker plate assembly, cam lubricator and vacuum control assembly. Degreasing compounds may damage condenser insulation or plastic insulators on the breaker plate assembly.
2. Inspect breaker plate assembly for damage or wear and replace if necessary.
3. Inspect mainshaft for wear, check its fit in the bushing in the distributor housing. If the shaft or

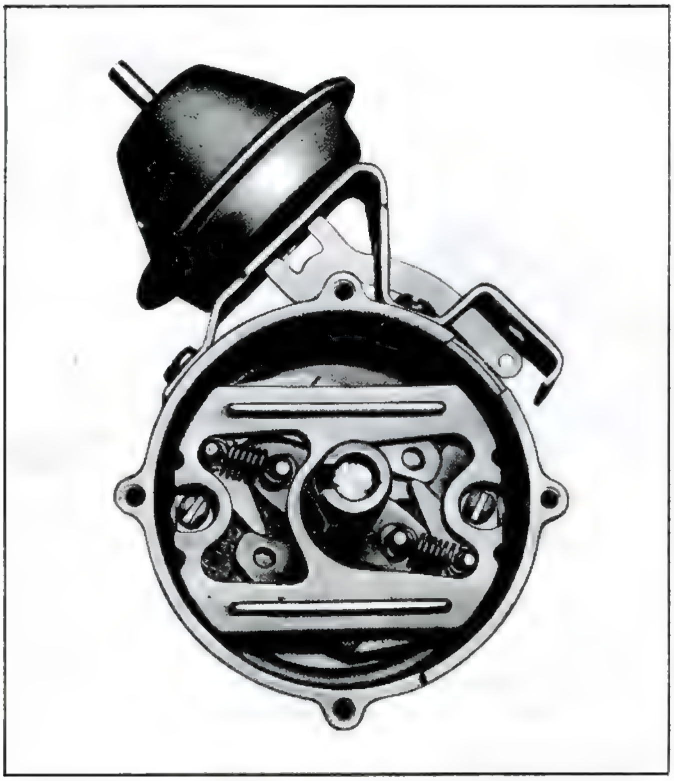


Fig. 7i—Weights, Weight Cover Installed

bushing is worn, the shaft and distributor body should be replaced.

NOTE: Distributor housing bushing not serviced separately.

4. Mount the shaft in "V" blocks and check the shaft alignment with a dial gauge. The runout should not exceed .002".
5. Inspect the governor weights for wear or burrs and free fit on their pins.
6. Inspect the cam for wear or roughness. Then check its fit on the end of the shaft. It should be absolutely free, without any looseness.
7. Inspect the condition of the distributor points (see Distributor Contact Points). Dirty points should be cleaned and badly pitted points should be replaced.
8. Test the condenser for series resistance, microfarad capacity (.18 to .23), leakage or breakdown, following the instructions given by the manufacturer of the test equipment used.
9. Inspect the distributor cap and spark plug wires for damage.

ASSEMBLY

Refer to Figure 6i for exploded view of distributor.

1. Replace cam assembly to mainshaft.

   NOTE: Lubricate top end of shaft with light engine oil prior to replacing.

2. Install weights on their pivot pins, replace weight springs. Install weight cover and stop plate (fig. 7i).
3. Lubricate mainshaft, install it in distributor housing.
4. Install thrust washers and driven gear to mainshaft, insert retaining roll pins. Check to see that shaft turns freely.

   NOTE: Install driven gear with mark on hub in line with rotor segment.

5. Position breaker plate assembly in housing and attach retaining screws (See Figure 2i).
6. Attach condenser and contact point set in proper location with appropriate attaching screws. Connect primary and condenser leads to contact set quick disconnect terminal.

   NOTE: Contact point set pilot must engage matching hole in breaker plate.

7. Attach vacuum control or retard unit assembly to distributor housing using upper mounting holes and install vacuum advance linkage cover.
8. Install cam lubricator.
9. Install dust shield and rotor to cam assembly.

INSTALLATION—ENGINE NOT DISTURBED

1. Turn rotor approximately 1/8 turn counter-clockwise past mark previously scratched on distributor housing.
2. Work distributor down into position in engine block with distributor positioned as noted prior to removal-vacuum control unit in same relative position to engine.

   NOTE: It may be necessary to move rotor slightly to start gear into mesh with crankshaft gear, but rotor should line up with the mark when distributor is down in place.

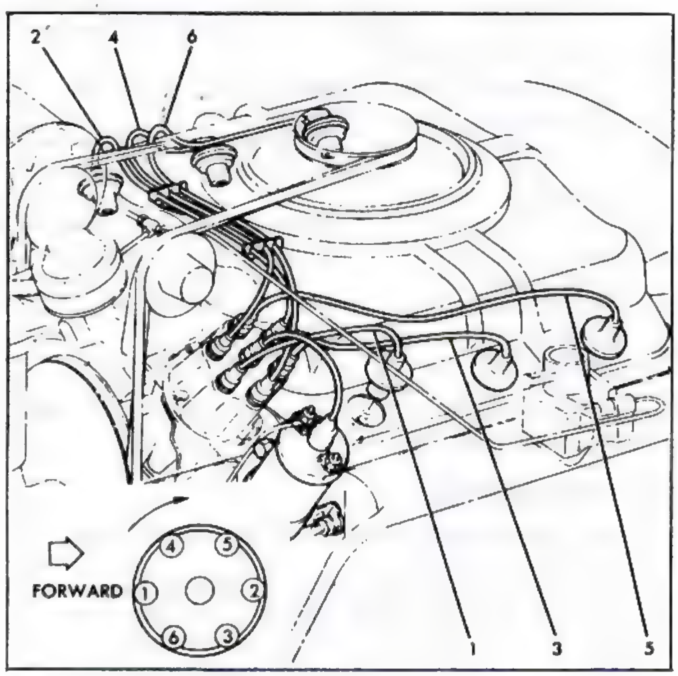


Fig. 8i—Distributor, Spark Plug Wires Installed

3. Replace distributor hold-down clamp and bolt. Connect primary lead to coil terminal. Replace distributor cap. Also install spark plug and coil secondary wires if removed (fig. 8i).

   CAUTION: Care should be used in tightening distributor cap screws to prevent cracking the cap.

   NOTE: Wires must be installed as indicated to prevent cross-firing.

4. Set points and time ignition as outlined under Engine Tune-Up, Section 7.
5. Connect vacuum hose to control unit.

INSTALLATION—ENGINE DISTURBED

1. Locate Number 1 piston in firing position by either of two methods described below.
   a. Remove Number 1 spark plug and with compression gauge on plug hole crank engine until compression is indicated in Number 1 cylinder. Continue cranking until crankshaft pulley timing notch lines up with "O" timing mark on engine rear housing or . . .
   b. Remove right bank rocker cover and crank engine until Number 1 intake valve closes and continue to crank slowly until "O" pointer lines up with timing notch on crankshaft pulley.
2. Position distributor to opening in block in normal installed attitude.
3. Position rotor to point toward harmonic balancer of engine (with distributor housing held in installed attitude), then turn rotor clockwise approximately 1/8 turn more toward left cylinder bank and push distributor down to engage crankshaft. It may be necessary to rotate rotor slightly until crankshaft engagement is felt.
4. While pressing firmly down on distributor housing, kick starter over a few times to make sure oil pump shaft is engaged. Install hold-down clamp and bolt and snug up bolt.
5. Turn distributor body slightly until points just open and tighten distributor clamp bolt.
6. Place distributor cap in position and check to see that rotor lines up with terminal for Number 1 spark plug.
7. Install cap, check all high tension wire connections and connect spark plug wires if they have been removed (See Figure 8i). It is important that the wires be installed in their proper location in the supports.
8. Connect vacuum line to distributor and distributor primary wire to coil terminal.
9. Start engine and set timing as described under Tune-up in Section 7.

COIL REPLACEMENT

1. Disconnect ignition switch and distributor leads from terminals on coils.
2. Pull high tension wire from center terminal of coil.
3. Remove the two coil support mounting bolts or loosen friction clamp screw and remove coil.
4. Place new coil in position and install attaching bolts or tighten clamp screw.
5. Place high tension lead securely in center terminal of coil and connect ignition switch and distributor primary leads to terminals on coil.
6. Start engine and test coil operation.

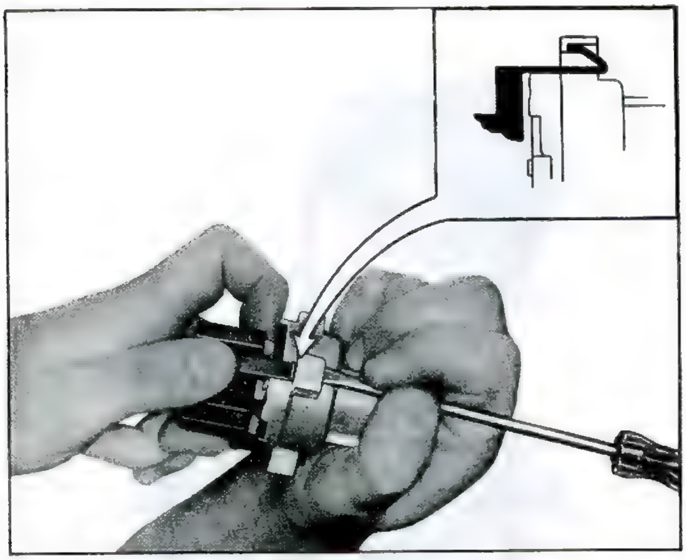


Fig. 9i—Unlocking Ignition Switch Connector

IGNITION SWITCH

Removal and Installation

1. Raise engine compartment lid and disconnect negative battery cable from battery.
2. Remove lock cylinder by positioning switch in "OFF" position and inserting wire in small hole in cylinder face. Push in on wire to depress plunger and continue to turn key counter-clockwise until lock cylinder can be removed.
3. Using suitable spanner wrench (Tool J-7607), remove the front attaching nut.
4. Pull the ignition switch out from under the dash and remove the wiring connectors.
5. To remove the "theft resistant" connector, the

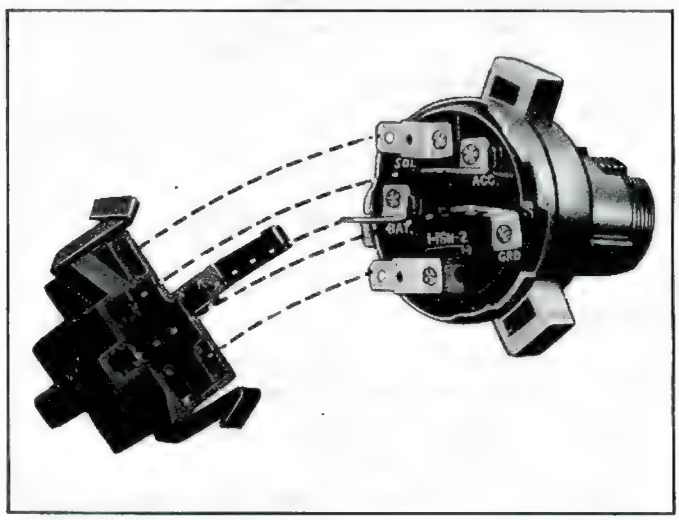


Fig. 10i—Switch and Connector Unplugged

switch must be out from under the dash as outlined in Step 4. Using a screw driver unsnap the locking tangs on the connector from their position on the switch as shown in Figure 9i. Unplug the connector.

6. Snap the connector into place on a new ignition switch (fig. 10i).
7. Place the switch into position from behind the dash and install the metal ignition switch nut.
8. Install the lock cylinder.
9. Install the battery cable to the battery and lower the engine compartment lid.

SPARK PLUGS

Removal

1. Remove spark plug wires.
2. Remove any foreign matter from around spark plugs by blowing out with compressed air.
3. Using a 13/16" spark plug socket, remove the spark plugs.

   NOTE: To remove or loosen the center spark plugs, it will be necessary to disconnect or remove carburetor throttle rod and use a universal drive on spark plug socket. It may be desirable to use a special spark plug socket that is equipped with an internal "O" ring seal to grip the spark plug and avoid the possibility of dropping spark plugs into engine shroud assembly.

Cleaning and Regapping

Clean the spark plugs thoroughly, using an abrasive-type cleaner. If the porcelains are badly glazed or blistered, the spark plugs should be replaced. All spark plugs must be of the same make and number or heat range. Use a round feeler gauge to adjust the spark plugs gaps to .035" (fig. 11i).

CAUTION: Before adjusting gap, file center electrode flat. In adjusting the spark plug gap, never bend the center electrode which extends through the porcelain center. Always make adjustment by bending the ground or side electrode.

Installation

1. Inspect spark plug hole threads and clean before installing plugs. Corrosion deposits can be removed with a 14 mm. x 1.25 SAE spark plug tap (available through local jobbers) or by using a small, soft wire brush in an electric drill. If a tap is used, coat it with plenty of grease to catch any chips.

   CAUTION: Use extreme care when using tap to prevent cross threading. Also, crank engine several times to blow out any material dislodged during cleaning operation.

2. Install spark plugs to engine using new gaskets and tighten to 20-25 ft. lbs. torque.

   NOTE: Do not use any "anti-seize" compound on spark plug threads as this will act as an insulator and not allow proper spark plug cooling. Be careful when installing plug to prevent gasket from falling into engine shroud assembly.

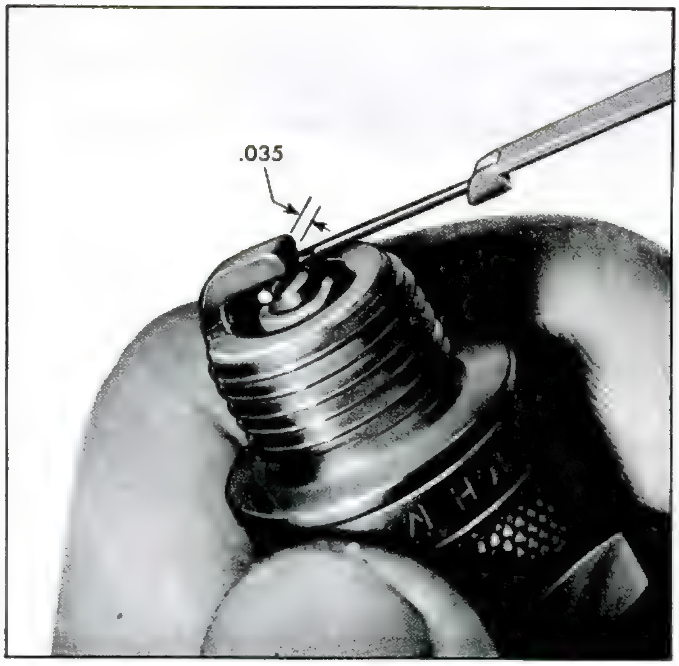


Fig. 11i—Setting Spark Plug Gap

It may be desirable to use a spark plug socket that is equipped with an internal "O" ring seal to grip the spark plug to start the plug into the cylinder head to avoid the possibility of dropping plugs into engine shroud assembly.

3. Secure wires and access covers.

   NOTE: Be certain spark plug access covers are tightly in place. If as many as two are loose, all air pressure in cooling system will be lost and engine will overheat. In addition, a whistling sound may develop that could be difficult to locate.

4. Reconnect carburetor throttle rod.

   NOTE: Improper installation is one of the greatest single causes of unsatisfactory spark plug service. Improper installation is the result of one or more of the following practices:

   - Installation of plugs with insufficient torque to fully seat the gasket.
   - Installation of plugs using excessive torque which changes gap settings.
   - Installation of plugs on dirty gasket seal.
   - Installation of plugs to corroded spark plug hole threads.
   - Installation of plugs using excessive torque or abuse which cracks porcelain or insulation.

Failure to install plugs properly will cause them to operate at excessively high temperatures and result in reduced operating life under mild operation or complete destruction under severe operation where the intense heat cannot be dissipated rapidly enough. Always remove corrosion deposits in hole threads before installing plugs. When corrosion is present in threads, normal

torque is not sufficient to compress the plug gasket and early failure from overheating will result. Always use a new gasket and wipe seats in head clean.

The gasket must be fully compressed on clean seats to complete heat transfer and provide a gas tight seal in the cylinder. For this reason as well as the necessity of maintaining correct plug gap, the use of correct torque is extremely important during installation.

STARTER CIRCUIT

INDEX

GENERAL DESCRIPTION

The function of the starting system, composed of the starting motor, solenoid and battery, is to crank the engine. The battery supplies the electrical energy, the solenoid completes the circuit to the starting motor, and the motor then does the actual work of cranking the engine.

The starting motor (fig. 1s) consists primarily of the drive mechanism, frame, armature, brushes, and field windings. The starting motor is a pad mounted 12-volt extruded frame type, having four pole shoes and four fields, connected in series with the armature. The aluminum drive end housing is extended to enclose the entire shift lever and plunger mechanism, protecting them from dirt, splash, and icing. The flange mounted solenoid switch operates the overrunning clutch drive by means of a linkage to the shift lever.

MAINTENANCE AND ADJUSTMENTS

No periodic lubrication of the starting motor or solenoid is required. Since the starting motor and brushes cannot be inspected without disassembling the unit, no service is required on these units between overhaul periods.

RESISTANCE CHECKS

Although the starting motor cannot be checked against specifications on the car, a check can be made for excessive resistance in the starting circuit. Place a voltmeter across points in the cranking circuit as outlined

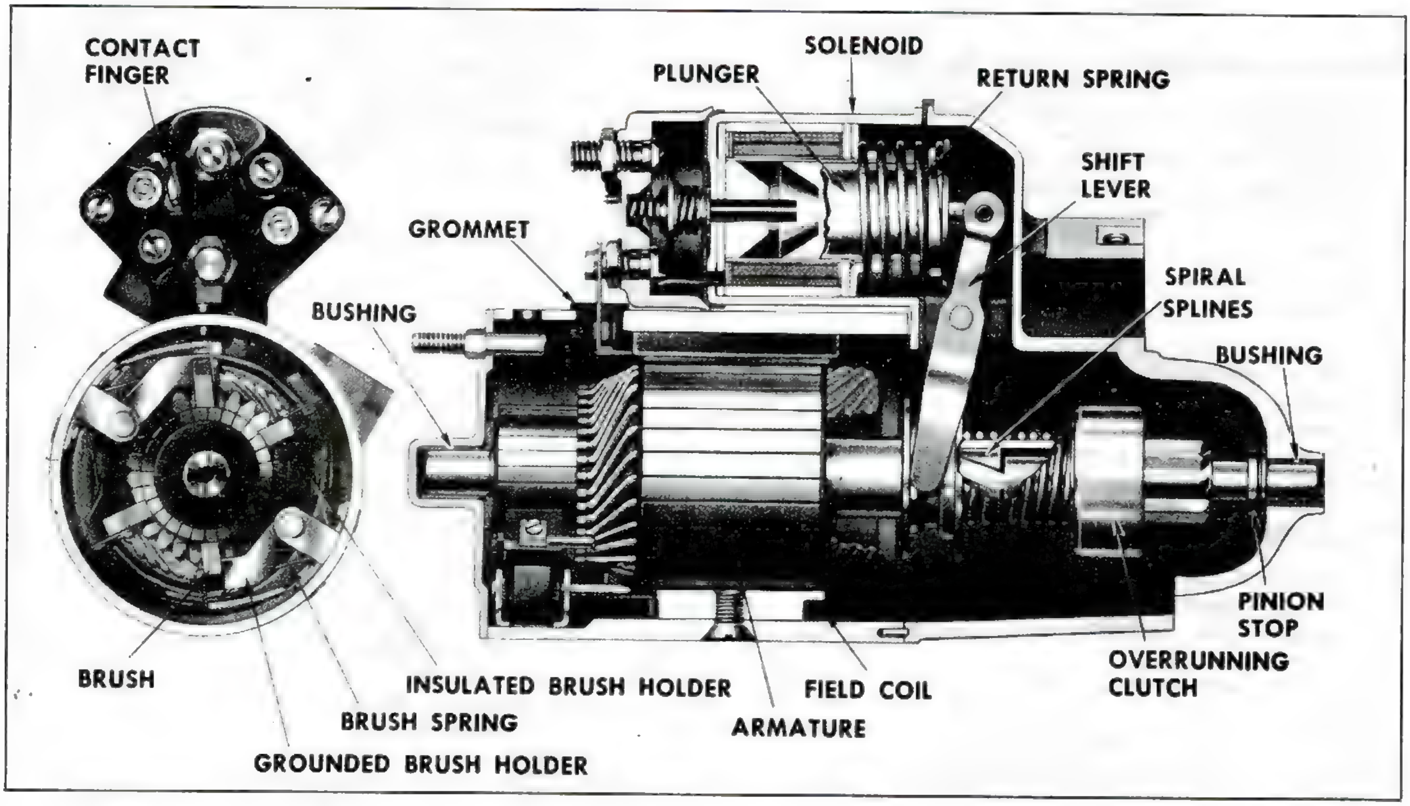


Fig. 1s—Starting Motor Cross Section (Typical)

below and observe the reading with the starting switch closed and the motor cranking (distributor primary lead grounded to prevent engine firing).

1. From battery positive post to solenoid battery terminal.
2. From battery negative post to starting motor housing.
3. From solenoid battery terminal to solenoid motor terminal.

If voltage drop in any of above check exceeds 0.2 volts, excessive resistance is indicated in that portion of starting circuit and the cause of the excessive resistance should be located and corrected in order to obtain maximum efficiency in the circuit.

CAUTION: Do not operate the starting motor continuously for more than 30 seconds to avoid overheating.

When the solenoid fails to pull in, the trouble may be due to excessive voltage drop in the solenoid control circuit. To check for this condition, close the starting switch and measure the voltage drop between the BATTERY terminal of the solenoid and the SWITCH (S) terminal of the solenoid.

1. If this voltage drop exceeds 3.5 volts, excessive resistance in the solenoid control circuit is indicated and should be corrected.
2. If the voltage drop does not exceed 3.5 volts and the solenoid does not pull in, measure the voltage available at the SWITCH terminal of the solenoid.
3. If the solenoid does not feel warm, it should pull in whenever the voltage available at the SWITCH terminal is 7.7 volts or more. When the solenoid feels warm, it will require a somewhat higher voltage to pull in.

STARTING MOTOR AND SOLENOID CHECK

The following checks may be made if the specific gravity of the battery is 1.215 or higher.

1. If the solenoid does not pull in, measure the voltage between the switch (S) terminal of the solenoid and ground with the starting switch closed.

   CAUTION: If the solenoid feels warm, allow to cool before checking.

   If the voltage is less than 7.7 volts, check for excessive resistance in the solenoid control circuit. If the voltage exceeds 7.7 volts, remove the starting motor and check (1) solenoid current draw, (2) starting motor pinion clearance, and (3) freedom of shift lever linkage.
2. If the solenoid "chatters" but does not hold in, check the solenoid for an open "hold-in" winding. Whenever it is necessary to replace a starting motor solenoid, always check starting motor pinion clearance.
3. If motor engages but does not crank or cranks slowly, check for excessive resistance in the external starting circuit, trouble within the starting motor, or excessive engine resistance to cranking.

SERVICE OPERATIONS

STARTING MOTOR

REMOVAL AND INSTALLATION (Fig. 2s)

1. Disconnect battery ground cable at battery.
2. Raise and support vehicle to a good working height.
3. Observe and record color coding of solenoid wiring connections (for installation purposes) then disconnect all wires at solenoid terminals.

   NOTE: It is a good idea to reinstall the nuts as each wire is disconnected as thread size is different buy may be mixed and stripped.
4. Remove the starter mounting bolts and lock washers.
5. Pull starter assembly forward to clear housing and remove starter.
6. Reverse the removal procedure to install then torque the mount bolts to 25-35 ft. lbs.
7. Check operation of starter on vehicle.

DISASSEMBLY

1. Disconnect the field coil connector from the motor solenoid terminal.
2. Remove the solenoid assembly (See Solenoid removal).
3. Remove starter thru bolts, end frame and field frame.
4. Remove shift lever pin snap ring and pin.
5. Remove armature assembly from drive housing.
6. Remove overrunning clutch from armature shaft as follows:
   a. Slide thrust collar off end of armature shaft.
   b. Slide a standard half-inch pipe coupling or other metal cylinder of suitable size (an old pinion of suitable size can be used if available) onto shaft so end of coupling or cylinder butts against edge of retainer (fig. 4s). Tap end of coupling with hammer, driving retainer towards armature end of snap ring.
   c. Remove snap ring from groove in shaft using pliers or other suitable tool. If the snap ring is

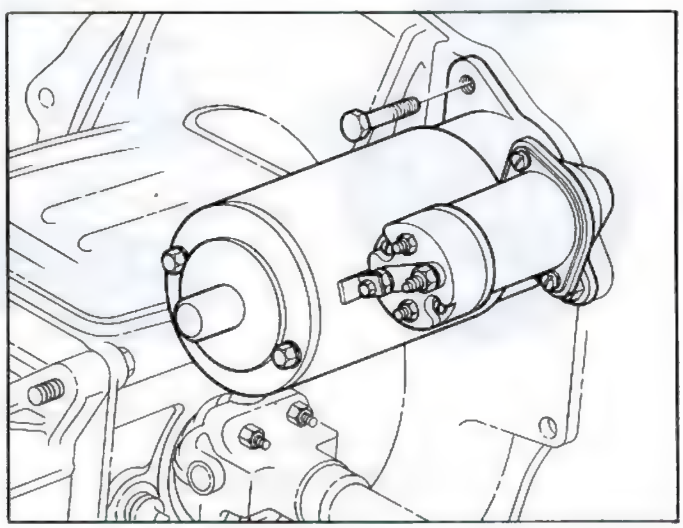


Fig. 2s—Starting Motor Installed

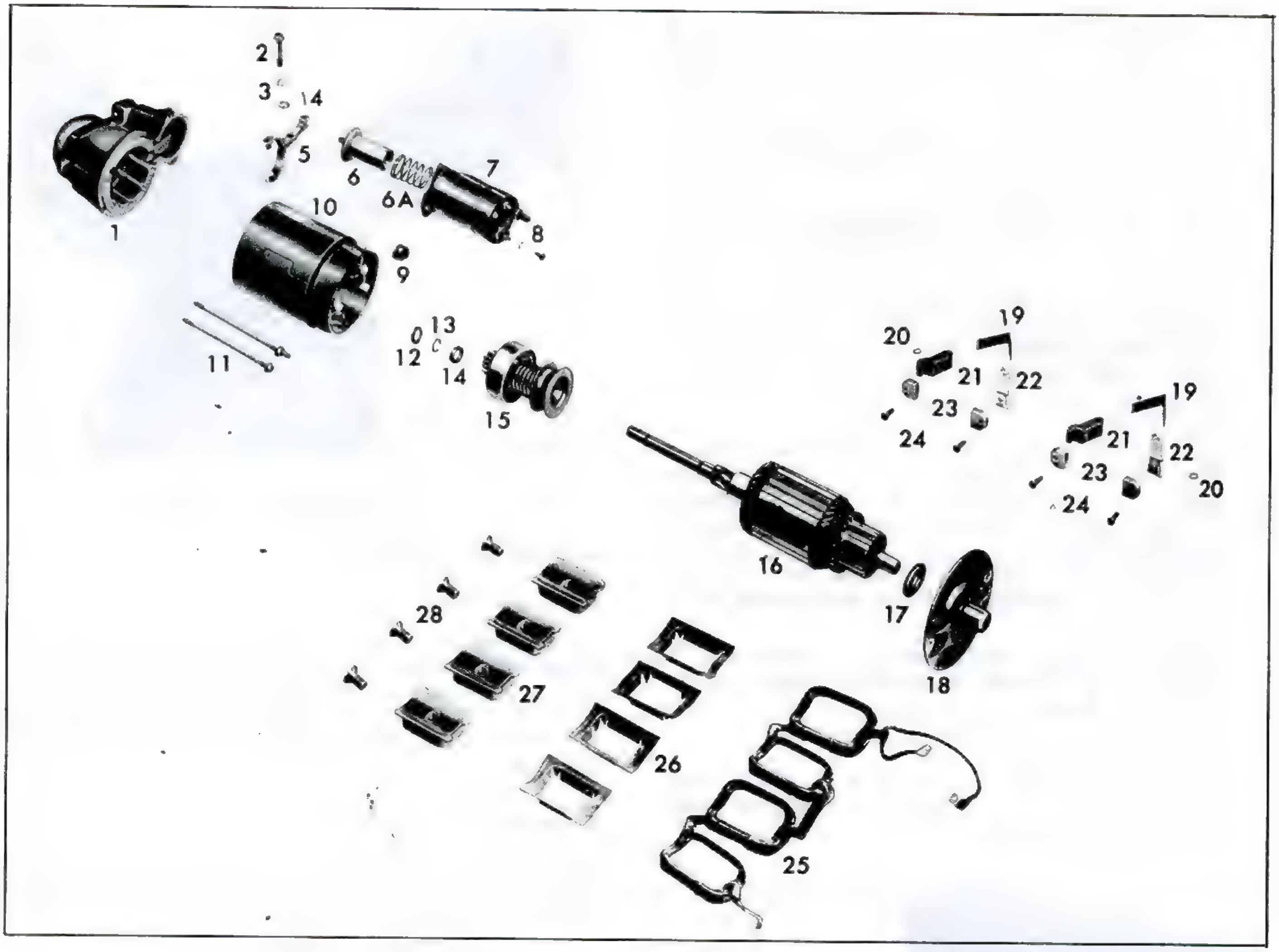


Fig. 3s—Starting Motor Parts Layout

1. Drive Housing
2. Shift Lever Bolt
3. Shift Lever Nut and Lock Washer
4. Pin
5. Shift Lever
6. Solenoid Plunger
6A. Solenoid Return Spring
7. Solenoid Case
8. Screw and Lock Washer
9. Grommet
10. Field Frame
11. Through Bolts
12. Thrust Collar
13. Snap Ring
14. Retainer
15. Overrunning Clutch Assembly
16. Armature
17. Braking Washer
18. Commutator End Frame
19. Brush Springs
20. Washer
21. Insulated Brush Holders
22. Grounded Brush Holders
23. Brushes
24. Screws
25. Field Coils
26. Insulators
27. Pole Shoes
28. Screws

too badly distorted during removal, it may be necessary to use a new one when reassembling clutch.

d. Slide retainer and clutch from armature shaft.

7. Disassemble brush rigging from field frame.
   a. Release "V" spring from slot in brush holder support.
   b. Lift brush holders, brushes, and spring upward as a unit and remove from support pin.
   c. Disconnect leads from each brush.
   d. Repeat operation for other set of brushes.

CLEANING AND INSPECTION

With the starting motor completely disassembled except for removal of field coils, the component parts should be cleaned and inspected as described below. Field coils need be removed only where defects in the coils are indicated by the tests described below, in which case the pole shoe screws should be removed and the pole shoes and field coils disassembled. Any defective parts should be replaced or repaired (see Repairs).

1. Clean all starting motor parts, but do not use grease dissolving solvent for cleaning the overrunning clutch, armature, and field coils since such a solvent would dissolve the grease packed in the clutch mechanism and would damage armature and field coil insulation.
2. Test overrunning clutch action. The pinion should turn freely in the overrunning direction and must not slip in the cranking direction. Check pinion teeth to see that they have not been chipped, cracked, or excessively worn. Check the spring for normal tension

and the drive collar for wear. If necessary the spring or collar can be replaced by forcing the collar toward the clutch and removing lock ring from end of tube.

3. Check brush holders to see that they are not deformed or bent, but will properly hold brushes against the commutator.
4. Check the condition of the brushes and if pitted or worn to one-half their original length, they should be replaced.
5. Check fit of armature shaft in bushing of drive housing. Shaft should fit snugly in the bushing. If the bushing is worn, it should be replaced. Apply a silicone lubricant to this bushing before reassembly. Also pack front grease groove. Avoid excessive lubrication.
6. Check fit of bushing in commutator end frame. If this bushing is damaged or worn excessively, the end frame assembly must be replaced. Apply a silicone lubricant to this bushing before reassembly. Avoid excessive lubrication. Lubricant forced onto the commutator would gum and cause poor commutation with a resulting decrease in cranking motor performance.
7. Inspect armature commutator. If commutator is rough or out of round, it should be turned down and undercut. Inspect the points where the armature conductors join the commutator bars to make sure that it is a good firm connection. A burned commutator bar is usually evidence of a poor connection. See "Turning the Commutator," described under Testing and Repairs.

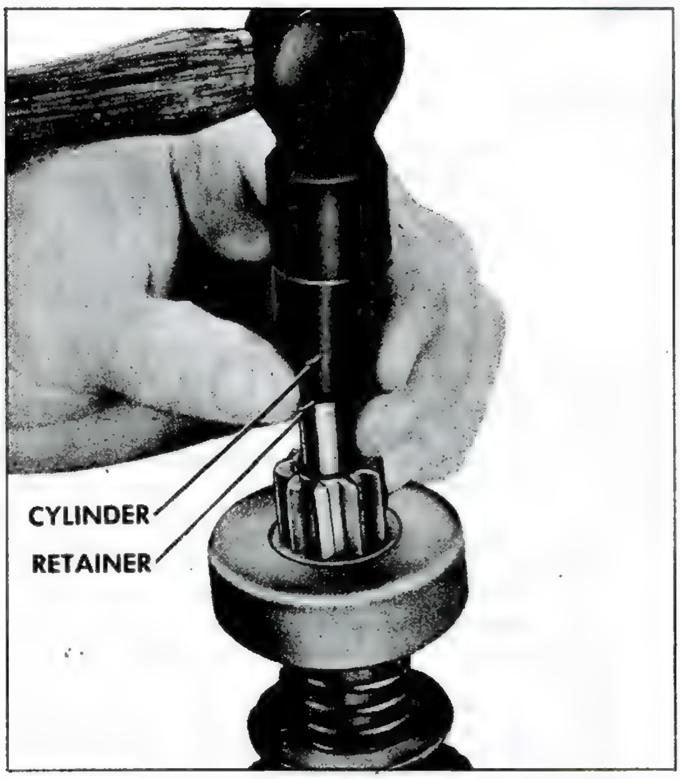


Fig. 4s—Driving Retainer off Snap Ring

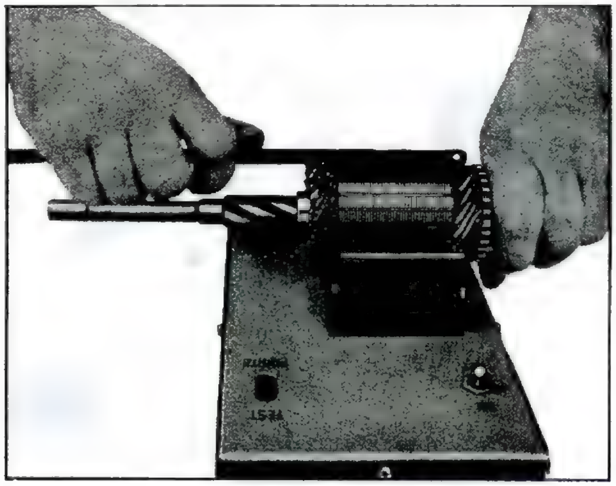


Fig. 5s—Armature Short Circuit Test

TESTING AND REPAIRS

Armature Test for Shorts

Check the armature for short circuit by placing on growler and holding hack saw blade over armature core while armature is rotated (fig. 5s). If saw blade vibrates, armature is shorted. Recheck after cleaning between the commutator bars. If saw blade still vibrates, replace the armature.

Armature Test for Ground

Place one lead on the armature core or shaft and the other on the commutator (fig. 6s). If the lamp lights, the armature is grounded and must be replaced.

Field Coil Test for Open Circuit

Place one lead on the insulated brush and the other to the field connector bar (fig. 7s). If the lamp does not light, the field coils are open and will require replacement.

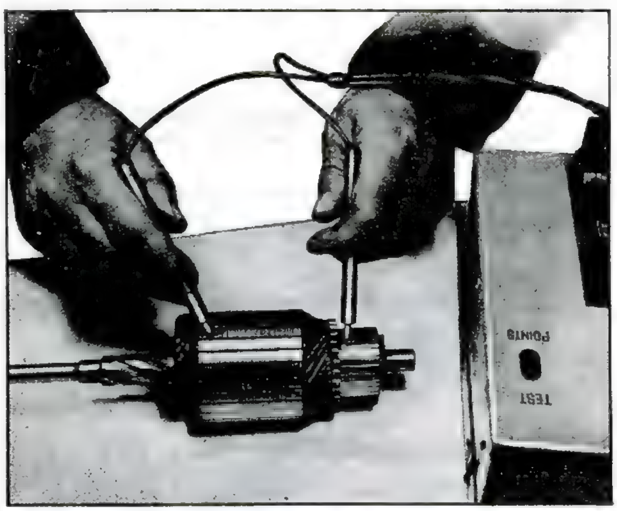


Fig. 6s—Armature Ground Test

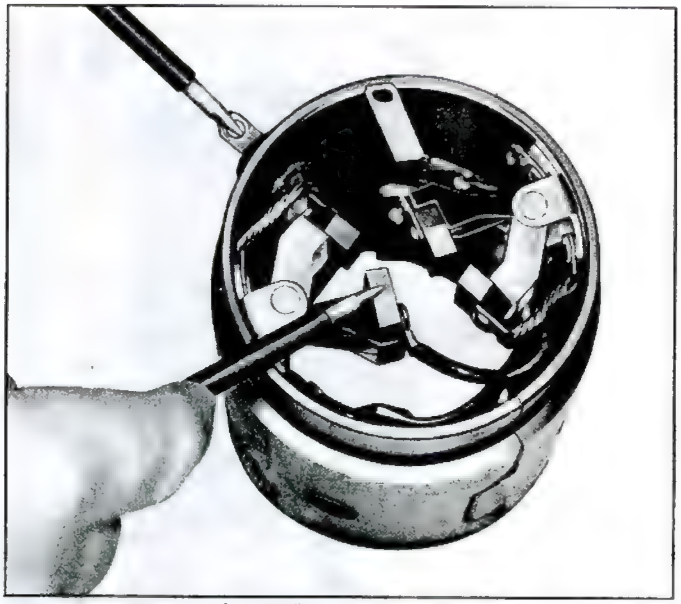


Fig. 7s—Field Coil Open Circuit Test

Field Coil Test for Ground

Place one lead on the connector bar and the other on the grounded brush (fig. 8s). If the lamp lights, the field coils are grounded.

Loose Electrical Connections

When an open soldered connection of the armature to commutator leads is found during inspection, it may be resoldered provided resin flux is used for soldering.

CAUTION: Acid flux must never be used on electrical connections.

When inspection shows commutator roughness, it should be cleaned as follows:

Turning the commutator

1. Turn down commutator in a lathe until it is thoroughly cleaned.

   CAUTION: Do not cut beyond section previously turned.

2. Undercut insulation between commutator bars 1/32". This undercut must be the full width of insulation and flat at the bottom; a triangular groove will not be satisfactory. After undercutting, the slots should be cleaned out carefully to remove any dirt and copper dust.
3. Sand the commutator lightly with No. 00 sandpaper to remove any slight burrs left from undercutting.
4. Recheck armature on growler for short circuits.

Brush Holder Replacement

If brush holders are damaged, they can be replaced by special service units which are attached with screws and nuts.

ASSEMBLY

After all parts have been thoroughly tested and inspected and worn or damaged parts replaced, the starter should be reassembled.

1. Assemble brush rigging to field frame.
   a. Assemble brushes to brush holders.
   b. Assemble insulated and grounded brush holder together with the "V" spring and position as unit on the support pin. Push holders and spring to bottom of support and rotate spring to engage the "V" in slot in support.

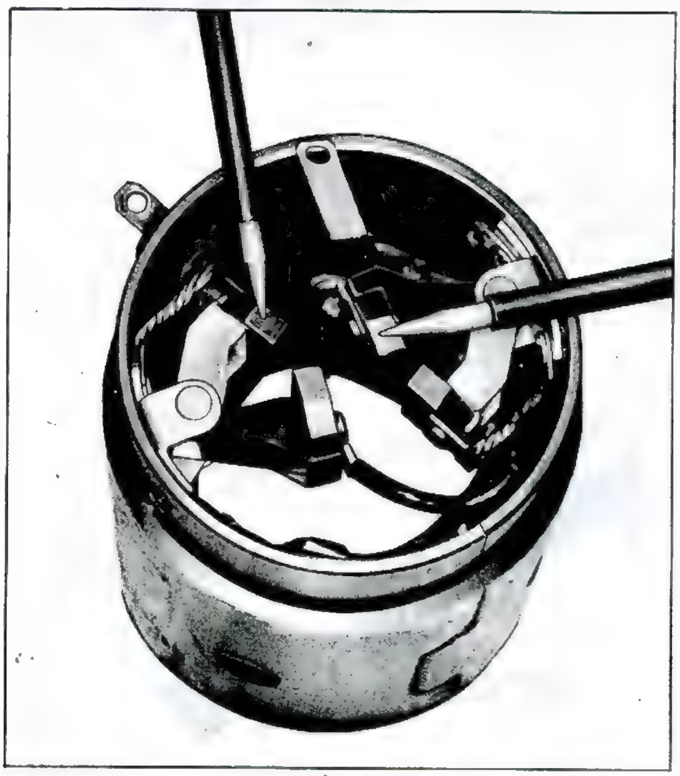


Fig. 8s—Field Coil Ground Test

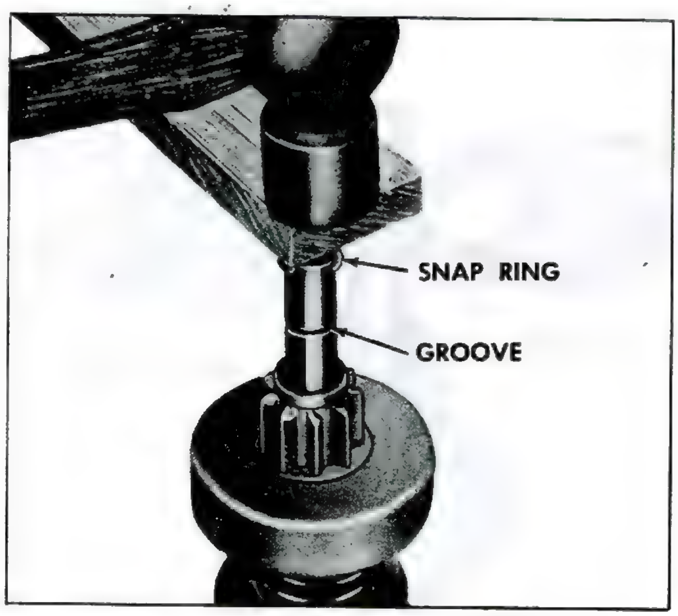


Fig. 9s—Forcing Snap Ring over Shaft

c. Attach ground wire to grounded brush and field lead wire to insulated brush.
d. Repeat for other set of brushes.

2. Assemble overrunning clutch assembly to armature shaft.
   a. Lubricate drive end of armature shaft with a silicone lubricant.
   b. Slide clutch assembly onto armature shaft with pinion outward.
   c. Slide retainer onto shaft with cupped surface facing end of shaft (away from pinion).
   d. Stand armature on end on wood surface with commutator down. Position snap ring on upper end of shaft and hold in place with a block of wood. Hit wood block a blow with hammer forcing snap ring over end of shaft (fig. 9s). Slide snap ring down into groove.
   e. Assemble thrust collar on shaft with shoulder next to snap ring.
   f. Place armature flat on work bench, and position retainer and thrust collar next to snap ring. Then, using two pair of pliers at the same time (one pair on either side of shaft), grip retainer and thrust collar and squeeze until snap ring is forced into retainer (fig. 10s).
3. Lubricate the drive housing bushing with a silicone lubricant. Make sure thrust collar is in place against snap ring and retainer and slide armature and clutch assembly into place in drive housing engaging shift lever with clutch.
4. Install shift lever pin and lock ring.
5. Position field frame over armature and apply special sealing compound between frame and solenoid case. Position frame against drive housing using care to prevent damage to the brushes.
6. Lubricate the bushing in the commutator end frame with a silicone lubricant. Place leather brake washer on armature shaft and slide commutator end frame onto shaft.

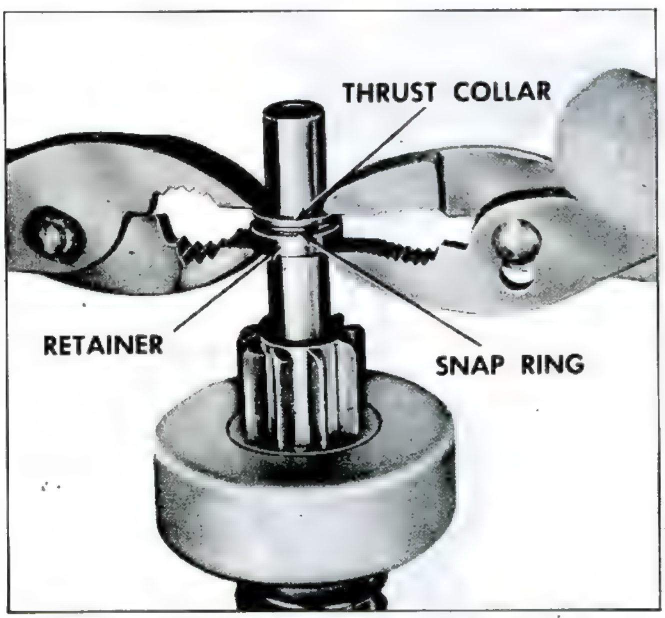


Fig. 10s—Forcing Snap Ring into Retainer

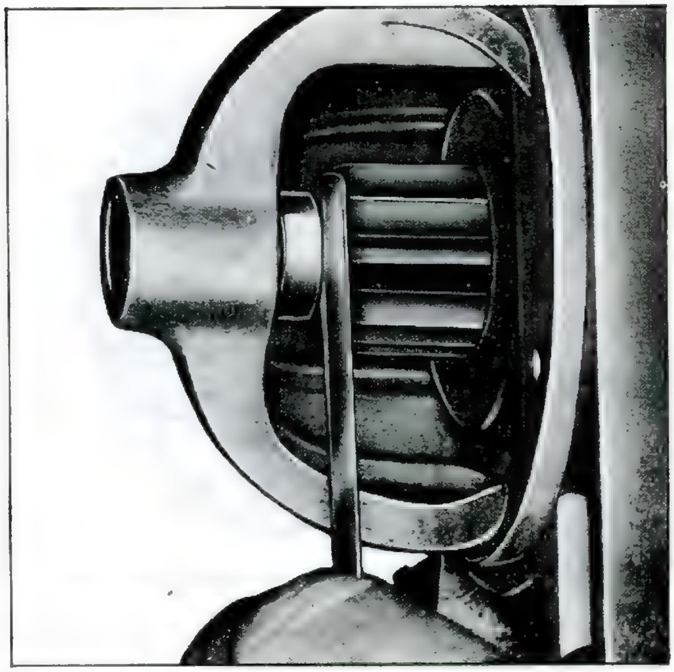


Fig. 11s—Checking Pinion Clearance

7. Reconnect the field coil connectors to the "motor" solenoid terminal.

After reassembly, a "Free Speed" check of the starting motor may be made if equipment is available. To make this check, connect a 12 volt battery in series with an ammeter to the starting motor terminal and ground. Use a mechanical drive type tachometer to determine the speed reached by the starting motor. Failure of the starting motor to perform according to specifications may be due to tight or dirty bushings, or high resistance connections.

Pinion Clearance

The pinion clearance should be checked (fig. 11s) after motor has been disassembled and then reassembled. If clearance is not within specified limits, (.010-.140) it may indicate excessive wear of solenoid linkage shift lever yoke buttons or improper assembly of the shift lever mechanism. Worn or defective parts should be

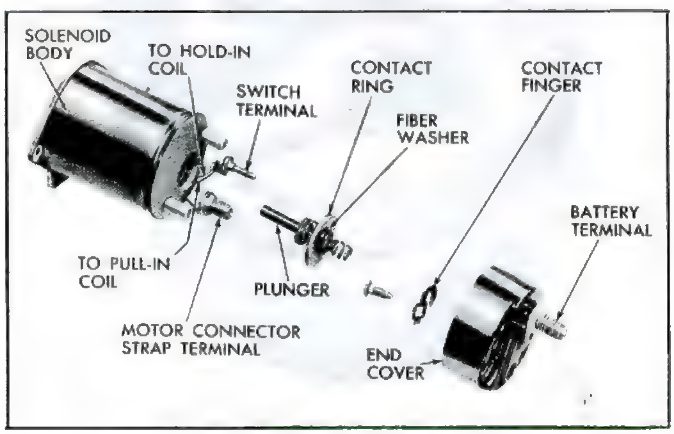


Fig. 12s—Exploded View of Solenoid

replaced since no provision is made for adjusting of pinion clearance.

SOLENOID

REMOVAL

1. Remove starting motor as previously described.
2. Remove the outer screw and washer from the motor connector strap terminal.
3. Remove the two screws retaining solenoid housing to end frame assembly.
4. Loosen through bolts and twist solenoid clockwise to remove flange key from keyway slot in housing; then remove solenoid assembly.

REPLACEMENT OF CONTACTS

1. With solenoid removed from motor, remove nuts and washers from Switch (S) and Motor connector strap terminals.
2. Remove the two solenoid end cover retaining screws and washers and remove end cover from solenoid body.
3. Compress solenoid plunger contact ring slightly and remove outer spring, retainer, fiber washer and contact ring (fig. 12s).
4. Remove nut and washer from battery terminal on end cover and remove battery terminal. Remove resistor by-pass terminal and contactor.
5. Remove motor connector strap terminal and solder new terminal in position.
6. Using a new battery terminal, install terminal washer and retaining nut to end cover. Install by-pass terminal and contactor.
7. Position end cover over switch and motor terminals and install end cover retaining screws. Also install washers and nuts on the solenoid switch and starting motor terminals.
8. Bench test solenoid for proper operation and reinstall using reverse of removal procedure.

SPECIAL TOOLS

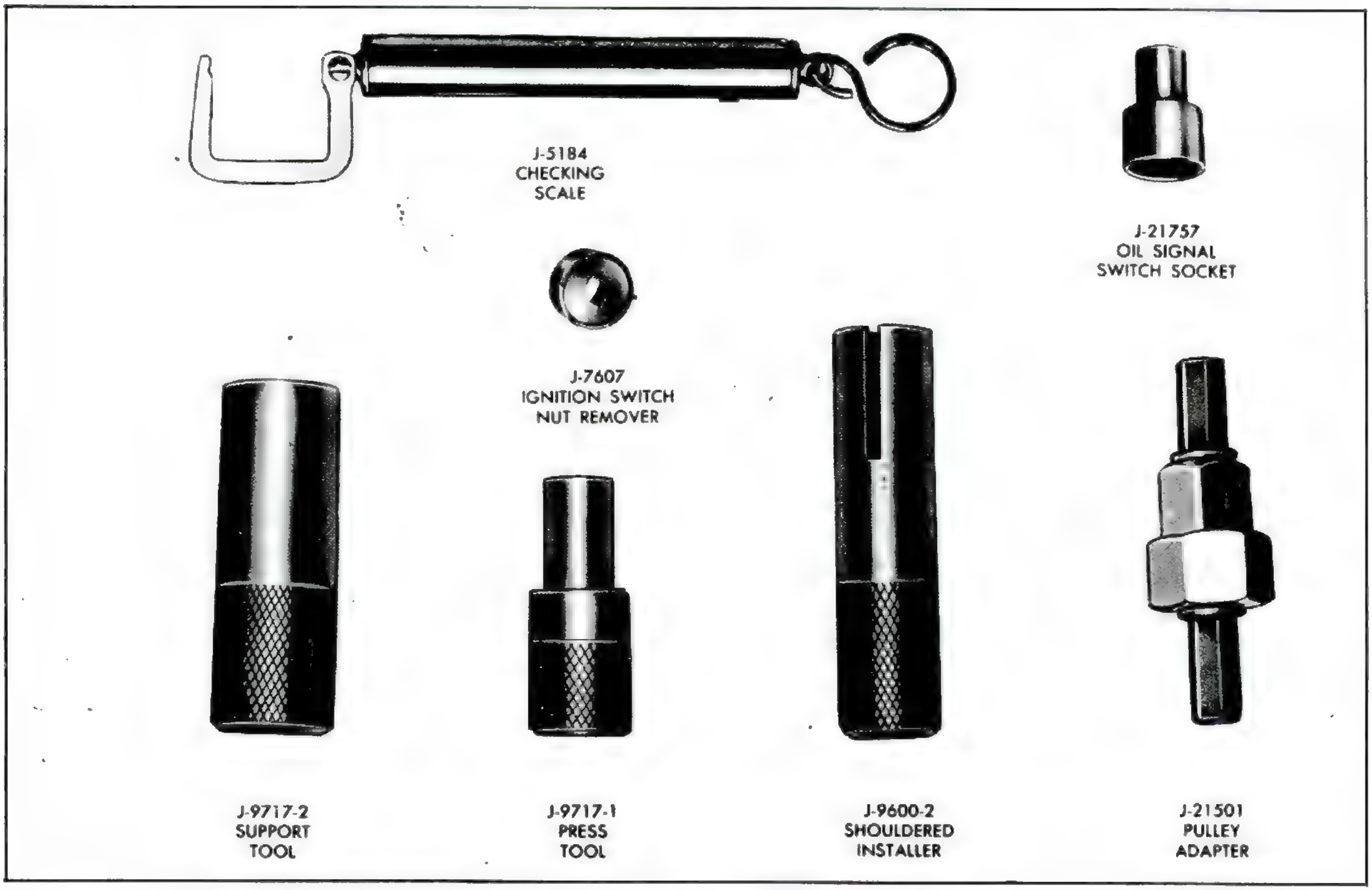


Fig. 13s—Special Tools

SECTION 7
CLUTCH AND TRANSMISSIONS

CONTENTS OF THIS SECTION

CLUTCH

INDEX

GENERAL DESCRIPTION

A bent finger diaphragm spring clutch mounted on a step face flywheel is used with the manual transmission. The clutch consists of two basic assemblies, the clutch cover and pressure plate assembly, and the clutch disc assembly. The clutch is attached at the front of the engine to the flywheel and is completely enclosed by the clutch housing (fig. 7-1). The driven disc is assembled between the flywheel and pressure plate.

A shorter throwout bearing (fig. 7-2) and fork ball stud are used with the bent finger clutch. Only the short ball stud is available in service with a spacer to be used when extra length is needed. Use of the longer throwout bearing (flat finger type) will cause inability to obtain free pedal travel, resulting in slippage and rapid clutch wear if incorrectly used on bent finger clutch assemblies.

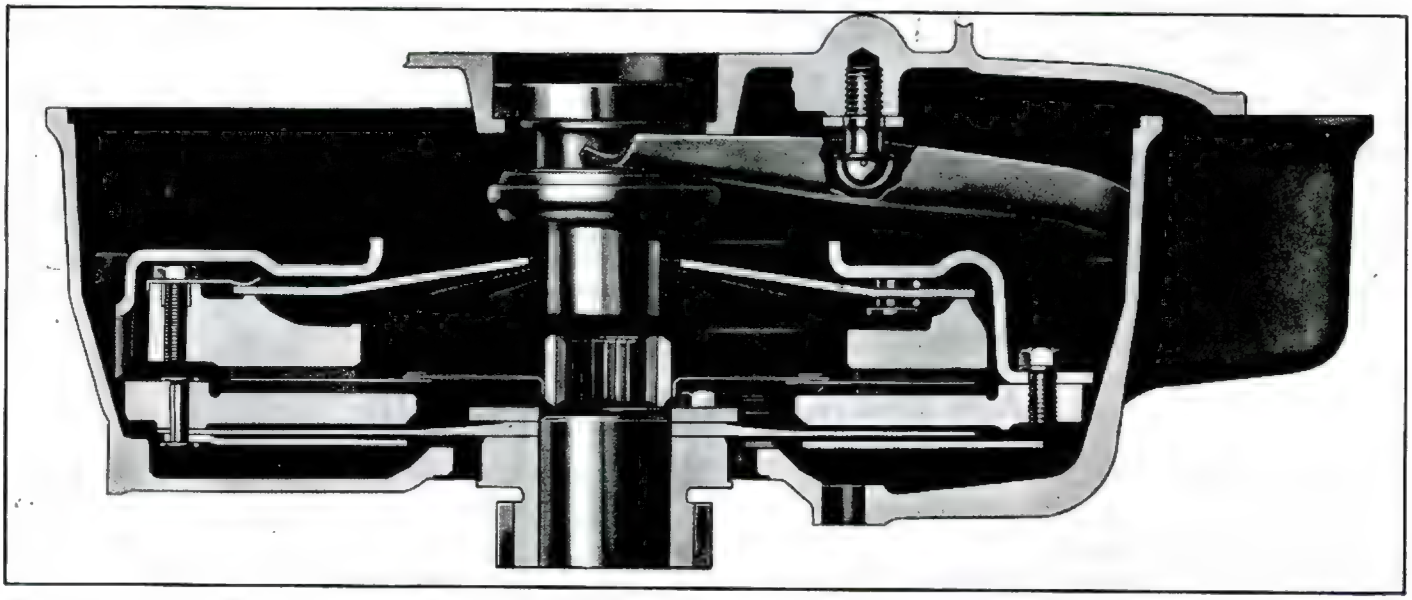


Fig. 7-1—Clutch Cross-Section

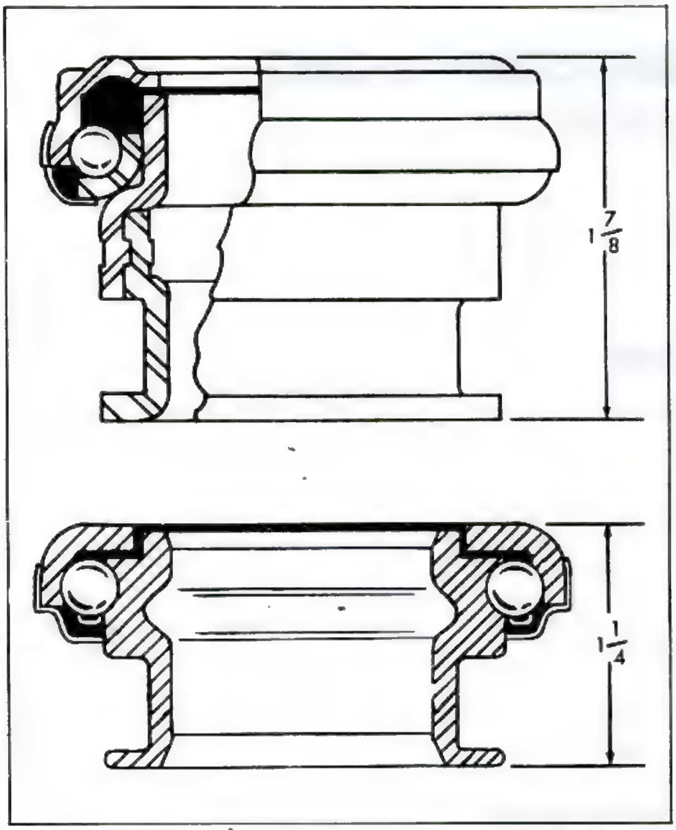


Fig. 7-2—Release Bearing Comparison

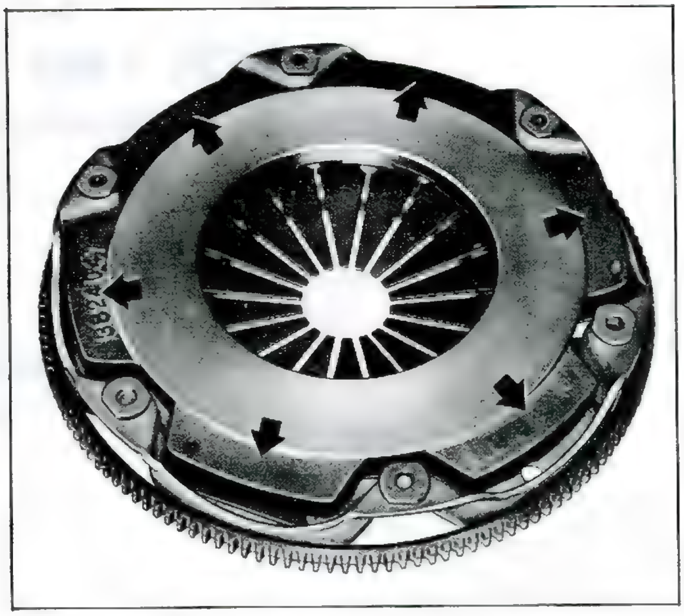


Fig. 7-3—Hi-Performance Clutch

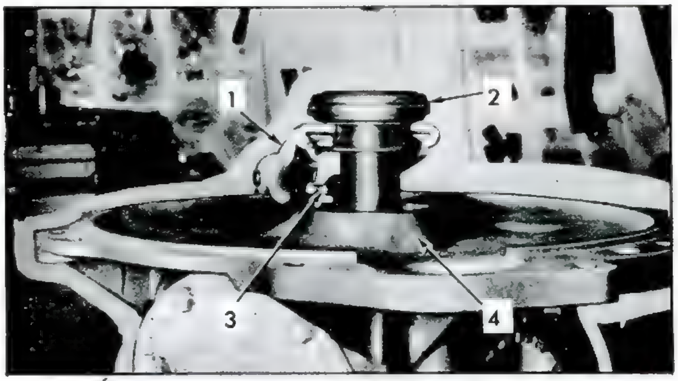


Fig. 7-4—Removing Clutch Release Bearing

1. Clutch Fork
2. Release Bearing
3. Ball Stud
4. Axle Housing

The input shaft from the transmission to the clutch is flexible torsionally; thus eliminating the need for damper springs in the clutch disc.

The clutch is operated with a conventional clutch fork, except that it is shorter and operates by pulling instead of pushing. The clutch fork engages the throwout bearing which is piloted on the axle housing (fig. 7-4).

The clutch fork pull rod assembly is a two piece design and provides for clutch lash at the swivel end which attaches to the cross shaft (fig. 7-9).

At the other end of the cross shaft assembly, the control cable is attached by means of a threaded swivel which is also adjustable to retain proper tension on the control cable. The clutch lever control cable assembly is made up of 3/32 inch diameter plastic coated cable crimped into the end of a 1/4 inch diameter steel rod. The cable assembly has an overall length of approximately 93 inches and is serviced as a complete assembly.

At the clutch pedal end, the pedal is attached to the clutch pedal shaft assembly which in turn also retains the brake pedal assembly. The clutch pedal shaft assembly is provided with a lever at one end with provisions for the attachment of the clutch lever control cable assembly. The shaft assembly is supported at the center by the dash brace and retained at the lever end by a bearing plate.

MAINTENANCE AND ADJUSTMENTS

CLUTCH LINKAGE ADJUSTMENT (Fig. 7-9)

1. Drive (5) Nut to within 1/8" of end of threads on Clutch Cable Rod Assembly.
2. Tension Clutch Cable Rod Assembly to 15 lbs. and thread (6) Swivel to line up with hole in (1) Shaft Assembly inboard Lever with lever located 7/8" from the transmission crossmember. (View B)
3. Torque (5) Nut to Swivel (6) using indicated torque of 8-12 ft. lbs.
4. Install (9) Spring (7) Washer and (8) Pin.
5. Manually pull (4) Clutch Pull Rod until shock is taken up at clutch fork. With (4) Clutch Pull Rod in this position align (3) Adjusting Rod with hole in outboard to Shaft Assembly Lever. Back off (3) Adjusting Rod three turns and assemble to lever with (2) Clip.

SERVICE OPERATIONS

CLUTCH ASSEMBLY

Removal from Vehicle

1. Remove engine axle and transmission assembly as outlined in "Power Train," Section 6.
2. Remove transmission and axle assembly from engine assembly as outlined in "Power Train," Section 6.
3. The clutch fork, ball stud and clutch release bearing is removed with the axle housing as shown in Figure 7-4.
4. Disconnect clutch fork from ball stud, and remove the clutch release bearing from the clutch release shaft.
5. Install Tool J-5824 to support the clutch assembly during removal.
6. Loosen the six clutch attaching bolts shown in Figure 7-5, one turn at a time, until clutch diaphragm spring pressure is released.
7. Remove Tool J-5824 and remove clutch assembly from the engine.

Disassembly

1. Remove three drive-strap to pressure plate bolts and retracting springs (fig. 7-6) and remove pressure plate from clutch cover.

   NOTE: When disassembling, identify position of pressure plate and cover. This marking will enable proper alignment during assembly.

2. The clutch diaphragm spring and two pivot rings are riveted to the clutch cover. Spring, rings and cover should be inspected for excessive wear or damage and if defective, it will be necessary to replace the complete cover assembly.

Inspection

1. Wash all parts, except clutch release bearing, in cleaning solvent.

   NOTE: The clutch release bearing is permanently packed with lubricant and should not be soaked in cleaning solvent as this may dissolve the lubricant.

2. Inspect pressure plate and flywheel for scores on the contact surfaces. Use a straight-edge and check for flatness of contact surfaces.
3. Check drive-straps for looseness at the clutch cover rivets and evidence of looseness at pressure plate bolt holes.
4. Check clutch release bearing for roughness and free fit on the sleeve of the axle clutch gear bushing retainer.
5. Inspect clutch disc for worn, loose or oil soaked facings, loose rivets or riding.
6. Examine splines in hub and make sure they slide freely on splines of clutch shaft. If splines are worn, the clutch disc or clutch gear shaft should be replaced as necessary.

Repairs

Pilot Bearing

The clutch pilot bearing is an oil impregnated type bearing pressed into the crankshaft. This bearing requires attention only when the clutch is removed from the vehicle, at which time it should be cleaned and inspected for excessive wear or damage and should be replaced if necessary. To remove, install Tool J-1448 and remove bearing from crankshaft. In replacing this bearing, use Tool J-1522. Place bearing on pilot of tool with radius in bore of bearing next to shoulder on tool and drive into crankshaft.

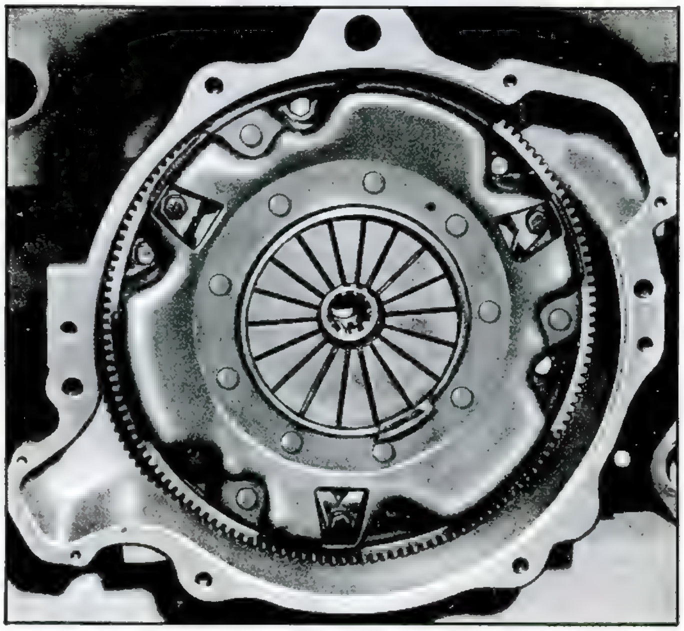


Fig. 7-5—Clutch Assembly Installed

Assembly

1. Install the pressure plate in the cover assembly, lining up identifying marks on pressure plate and the cover modes at time of disassembly.

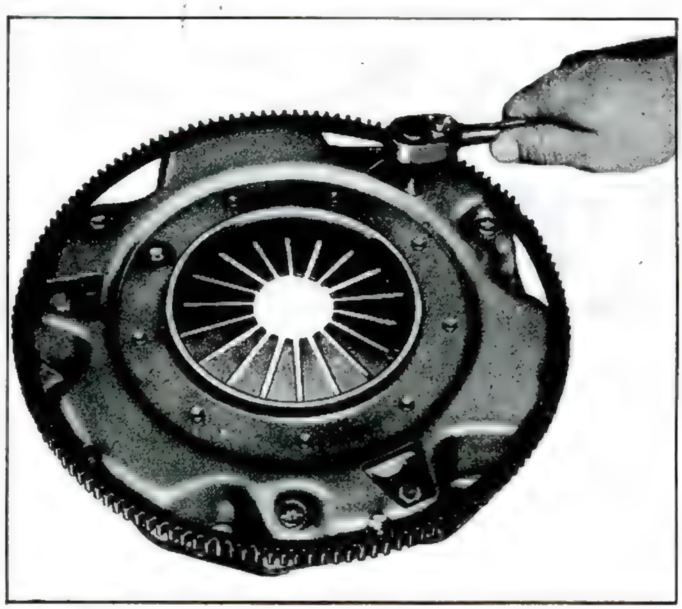


Fig. 7-6—Removing Drive-Strap Bolts

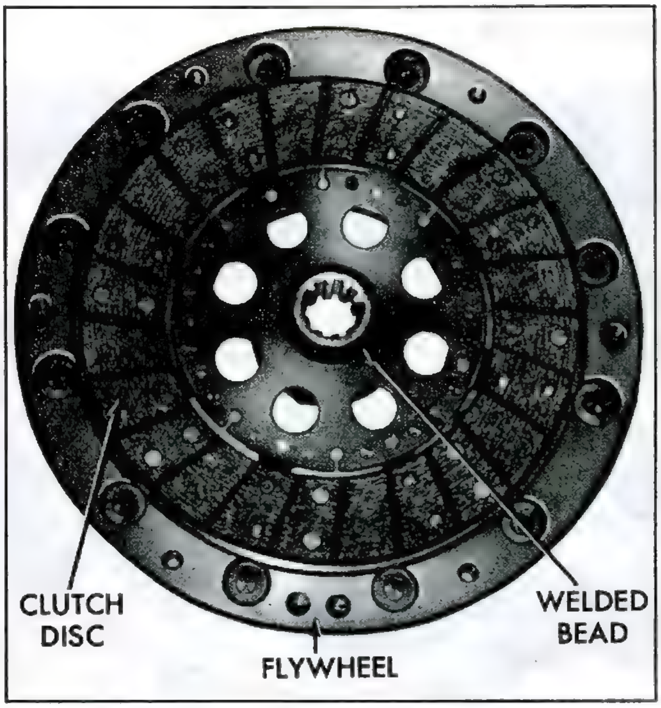


Fig. 7-7—Clutch Disc Installed

2. Install pressure plate retracting springs and drive-strap to pressure plate bolts and lock washers and tighten to 15-20 ft. lbs. torque. The clutch is now ready to be installed on the engine.

Turbo-Super Charged Engine Clutch

This clutch has a pearlitic malleable or nodular iron pressure plate identified by 6 large cast lugs on the outer diameter (fig. 7-3) and must be used on this engine. The complete assembly may be used with the super-turbo-air engine.

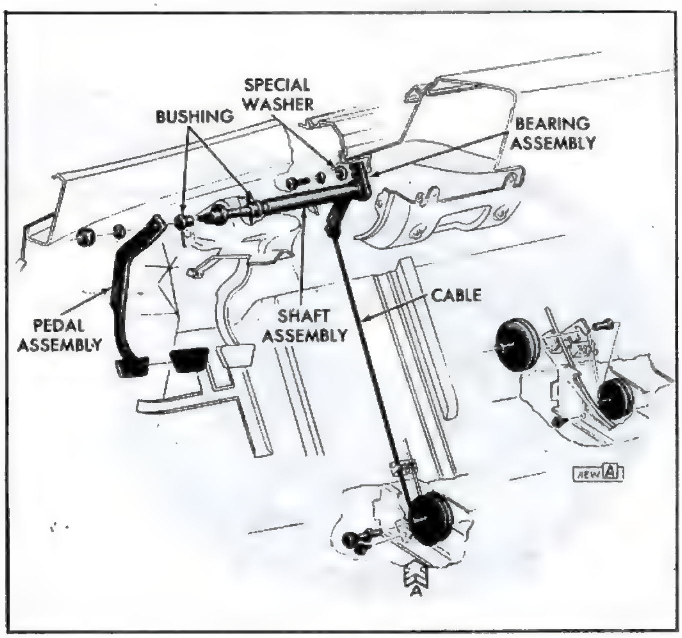


Fig. 7-8—Clutch Pedal and Cable

Installation to the Engine

1. Install clutch disc so the short hub is located on the flywheel side of the driven plate hub, as shown in Figure 7-7. This side is stamped "Flywheel Side".

   CAUTION: The clutch driven disc should be installed with the short hub side toward the flywheel. This side is marked "Flywheel Side." The welded bead on the other hub will always be installed toward the pressure plate finger side.

2. Install pressure plate and cover assembly and support them with Tool J-5824.
3. Install bolts and lock washers (fig. 7-5) in every other hole in cover assembly first, and pull down gradually until tight. Then install remaining 3 bolts.
4. Remove clutch pilot Tool J-5824.
5. Pack clutch fork ball seat with a small amount of high melting point grease.
6. Lubricate the recess on the inside of the clutch release bearing collar and coat the fork groove with a small amount of graphite grease.

   CAUTION: Be careful not to use too much lubricant.

7. Install clutch fork on the clutch fork ball and the clutch release bearing on the axle housing (fig. 7-4).
8. Install axle housing and transmission as outlined in Section 6, under "Assembly of Power Train Major Components".

   NOTE: Be sure fork is properly seated on ball stud.

Installation in the Vehicle

Refer to Section 6 "Installation of Power Train to Vehicle".

CLUTCH PEDAL, SLEEVE BUSHINGS AND BEARING (Fig. 7-8)

Removal

1. Remove nut and lock washer retaining clutch pedal assembly to pedal shaft assembly and remove pedal.
2. Remove bolt, lock washer and special flat washer retaining shaft bearing assembly to dash support.
3. The pedal shaft assembly and its bushings may now be removed from its support assembly and the clutch cable.
4. Check the nylon sleeve bushings and bearing assembly for wear or damage and replace necessary parts.

Installation

1. Reverse removal procedure, using a little lubriplate on sleeve bushings and bearing assembly.
2. Torque bearing assembly to dash support bolt to 100-140 in. lbs., and pedal to shaft retaining nut to 30-35 ft. lbs.
3. Check and adjust clutch linkage as outlined under "Clutch Linkage Adjustment".

CLUTCH CABLE ASSEMBLY

Removal (Fig. 7-9)

1. Remove return spring from clutch cross shaft bracket and rear cable swivel, at cross shaft inboard lever.
2. Remove cotter pin and washer from swivel and remove swivel from cross shaft.

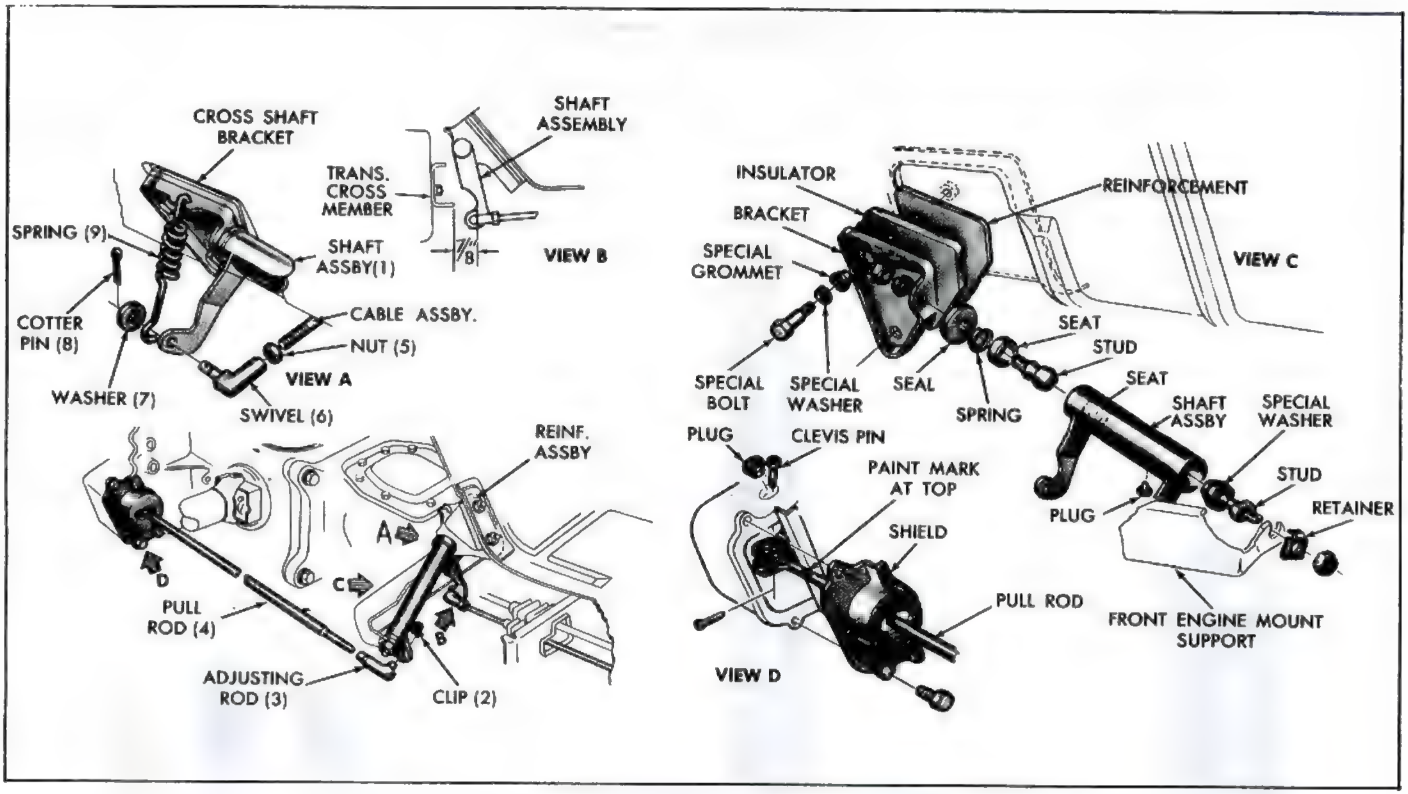


Fig. 7-9—Clutch Linkage Exploded

3. Loosen swivel check nut and remove both swivel and nut from cable assembly.
4. Remove body tunnel and access covers.
5. Unhook cable assembly from clutch pedal shaft assembly and remove complete cable assembly.

Installation (Fig. 7-9)

1. To install cable reverse the "Removal" procedures above.
2. Adjust clutch as outlined under "Clutch Linkage Adjustment".

CLUTCH LEVER CONTROL CROSS SHAFT AND BALL STUDS (Fig. 7-9)

Removal

1. Remove clutch return spring. Remove clutch cable swivel cotter pin and washer then remove swivel from cross shaft inboard lever.
2. Remove clutch pull rod swivel retainer clip at cross shaft outboard lever, and remove swivel from cross shaft.
3. Remove ball stud retainer nut at engine mount bracket.
4. Lift up on cross shaft and ball stud to clear bracket and remove ball stud and special washer from outboard end of cross shaft.
5. Cross shaft and inboard ball stud seat are now free for removal.
6. Remove the inboard ball stud retainer nut and lock washer from body mount bracket, and remove ball stud, seat, spring retainer and seal.
7. Check all parts for damage and wear especially the ball stud seats, spring retainer and seal. Replace necessary parts.

Installation

1. Lubricate ball stud and seats with chassis lubricant and reverse Removal procedure for assembly, referring to Figure 7-9 for order of assembly.
2. Torque inboard ball stud retainer nut to 11-16 ft. lbs. and outboard stud retainer nut to 30-35 ft. lbs.

   CAUTION: Position outboard ball stud in its bracket slot, all the way down before tightening.

3. Check and adjust clutch linkage as outlined under "Clutch Linkage Adjustment".

SPECIAL TOOLS

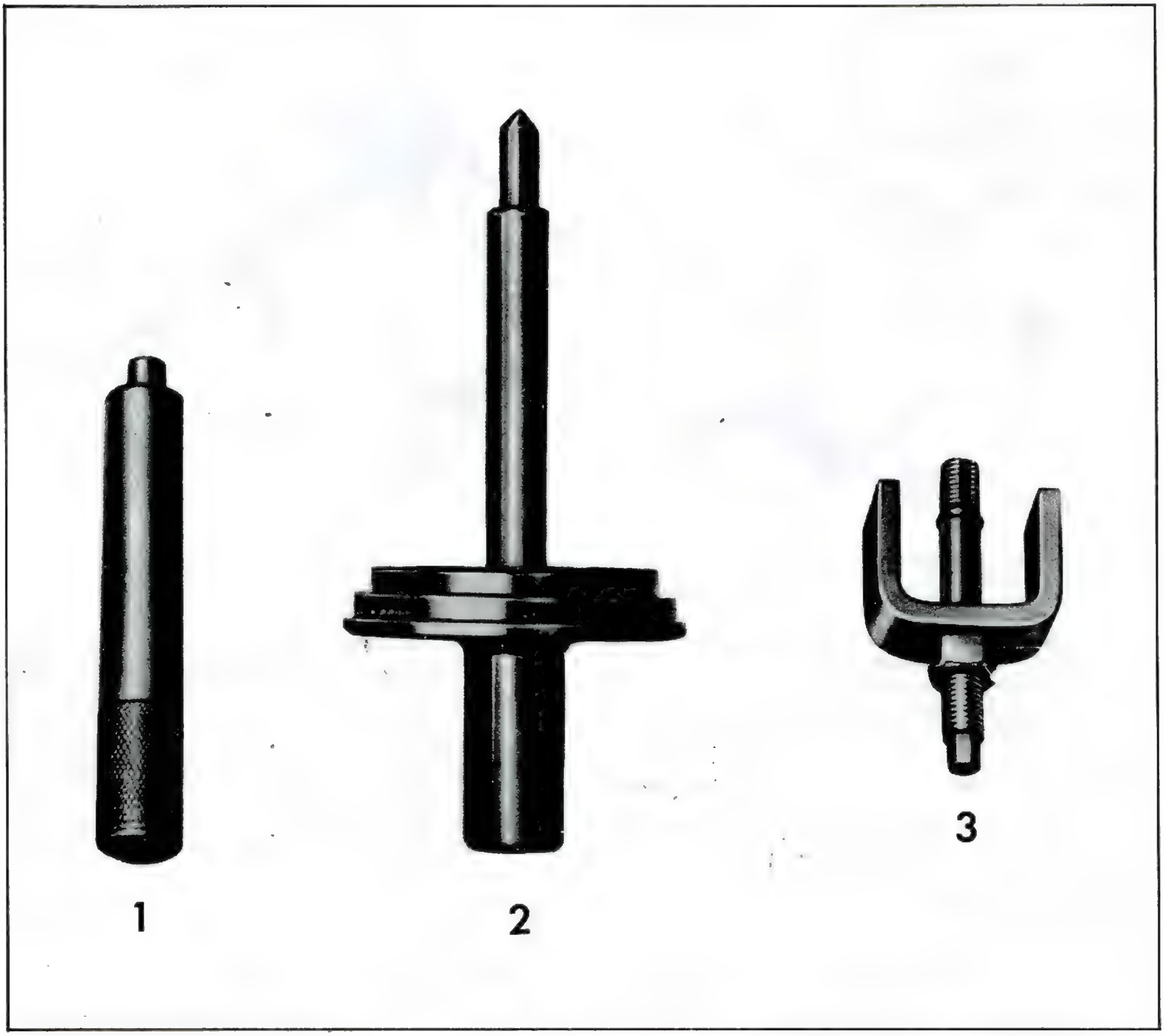


Fig. 7-10—Clutch Special Tools

1. J-1522 Pilot Bearing Driver
2. J-5824 Clutch Pilot Tool
3. J-1448 Pilot Bearing Puller

SECTION 7
MANUAL TRANSMISSIONS
THREE SPEED TRANSMISSION

INDEX

GENERAL DESCRIPTION

In essence, the Corvair manual three speed transmission is a conventional synchromesh type except for the use of concentric input and output shafts and its mounting on the differential carrier (fig. 7A-1)

Because of its attachment to the differential carrier, the mainshaft is hollow to permit passage of the clutch shaft to the front of the transmission to the clutch gear. The clutch gear drives a countergear and the remaining power flow sequence is identical to the conventional three speed transmission.

The shift mechanism used is basically a single shift rod system. From the transmission, the single shift rod is connected by a rubber sleeve coupling to the main control shaft assembly which is mounted in the tunnel by one nylon bushed bracket. A socket is integral to the front of the control shaft which receives the double sphere end of the gearshift lever, being floor mounted in the passenger compartment. The upper sphere rotates the control tube for gear selection and the lower sphere moves the control tube fore and aft to shift its gear.

In the transmission, the shift rod carries a finger which extends upward to engage either the first and reverse fork or the second and third fork, depending on shift lever position. As the two forks are parallel to each other, a slight rotational motion of the shift rod places the actuating finger in the proper fork and permits the desired shift. An interlock between the two fork shafts holds the fork not being actuated in the neutral crossover position.

MAINTENANCE AND ADJUSTMENTS

LUBRICATION

Common lubricant, specified in Section 0, is used in the manual three speed transmission and differential carrier so no oil seals are used between these units. Actually there is some interchange of lubricant but a lubricant dam is formed at the transmission which prevents entrapment of excess lube in the carrier sump which is below the transmission level and maintain transmission lubrication on grades.

Oil Level Check

Periodically check the lubricant of the three speed Transaxle by removing the filler plug in the differential carrier. If oil is at the level of carrier filler plug, both the carrier and transmission lubricant levels are satisfactory. If oil is below filler plug, add oil to the carrier as required, then check the lubricant level in the transmission by removing its filler plug. Replenish as necessary.

CAUTION: Under no circumstances should any lubricant containing active sulphur be used. Also, do not use mineral oil. Only lubricant specified in Section 0 should be used.

Oil Change

To change oil, drain both the differential carrier and three speed transmission by removing the drain plug provided in each. Reinstall the drain plugs and refill each unit to the level of the filler plugs with Lubricant specified in Section 0.

Complete refills require a total of 4.9 pints lubricant (approximately 2-1/2 pints for each unit).

SHIFT LINKAGE ADJUSTMENT

If transmission shift difficulties are experienced, such as those that might be caused by linkage bind or the operator's gearshift control lever being mispositioned,

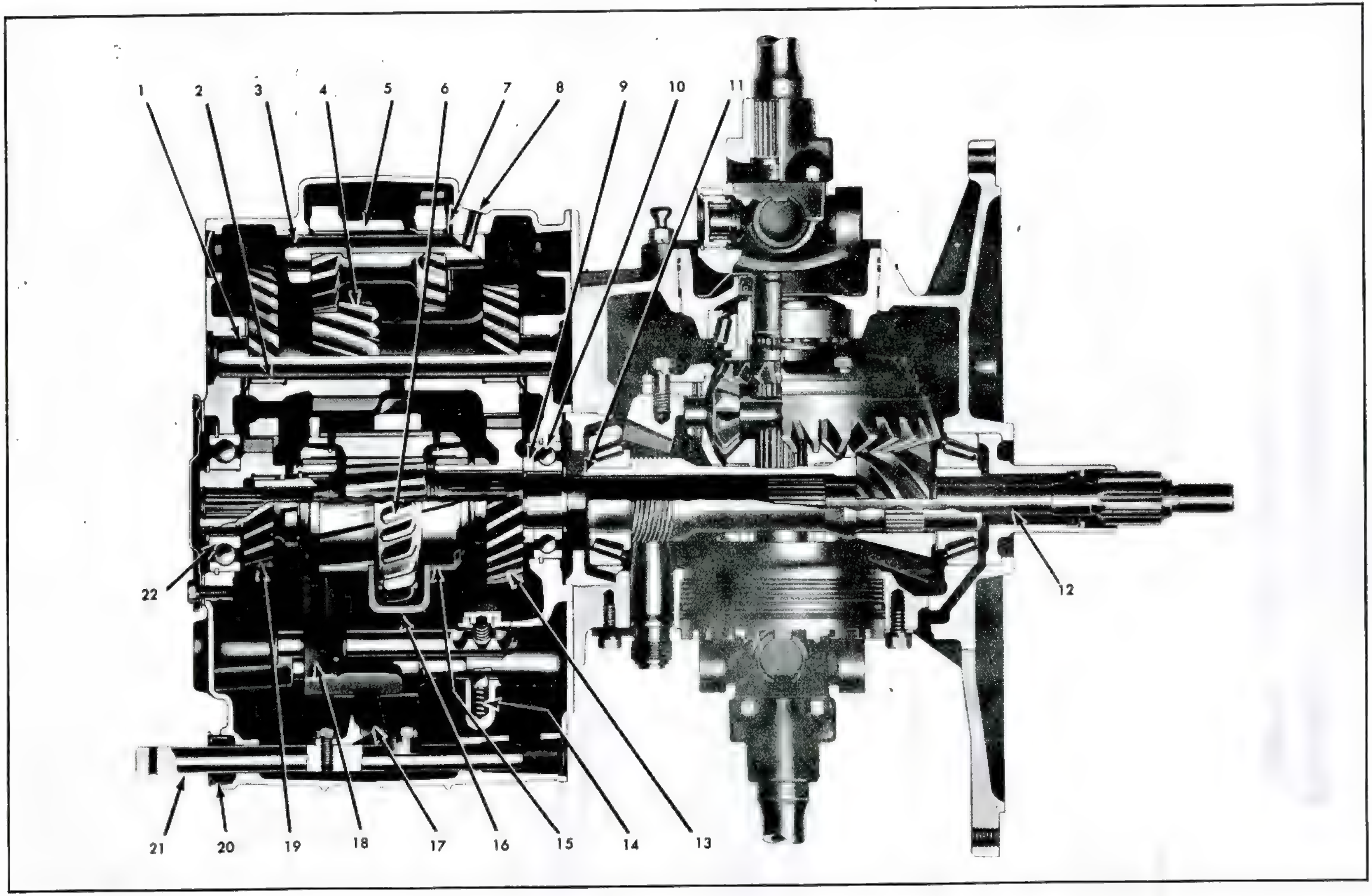


Fig. 7A-1—Three Speed Transaxle—Cross Sectional View (LDFC Shown)

1. Countergear Shaft
2. Countergear Needle Bearings
3. Reverse Idler Gear Shaft
4. Countergear
5. Reverse Idler Gear
6. First and Reverse Sliding Gear
7. Radial Needle Bearing (Torrington)
8. Reverse Idler Shaft Retaining Pin
9. Thrust Washer
10. Mainshaft Bearing
11. Mainshaft
12. Input Shaft
13. Second-Speed Gear
14. First and Reverse Detent Spring and Ball
15. Second and Third Speed Clutch
16. First and Reverse Shift Fork
17. Manual Shift Shaft Finger
18. Second and Third Speed Shift Fork
19. Clutch Gear
20. Manual Shift Shaft Seal
21. Manual Shift Shaft
22. Clutch Gear Bearing

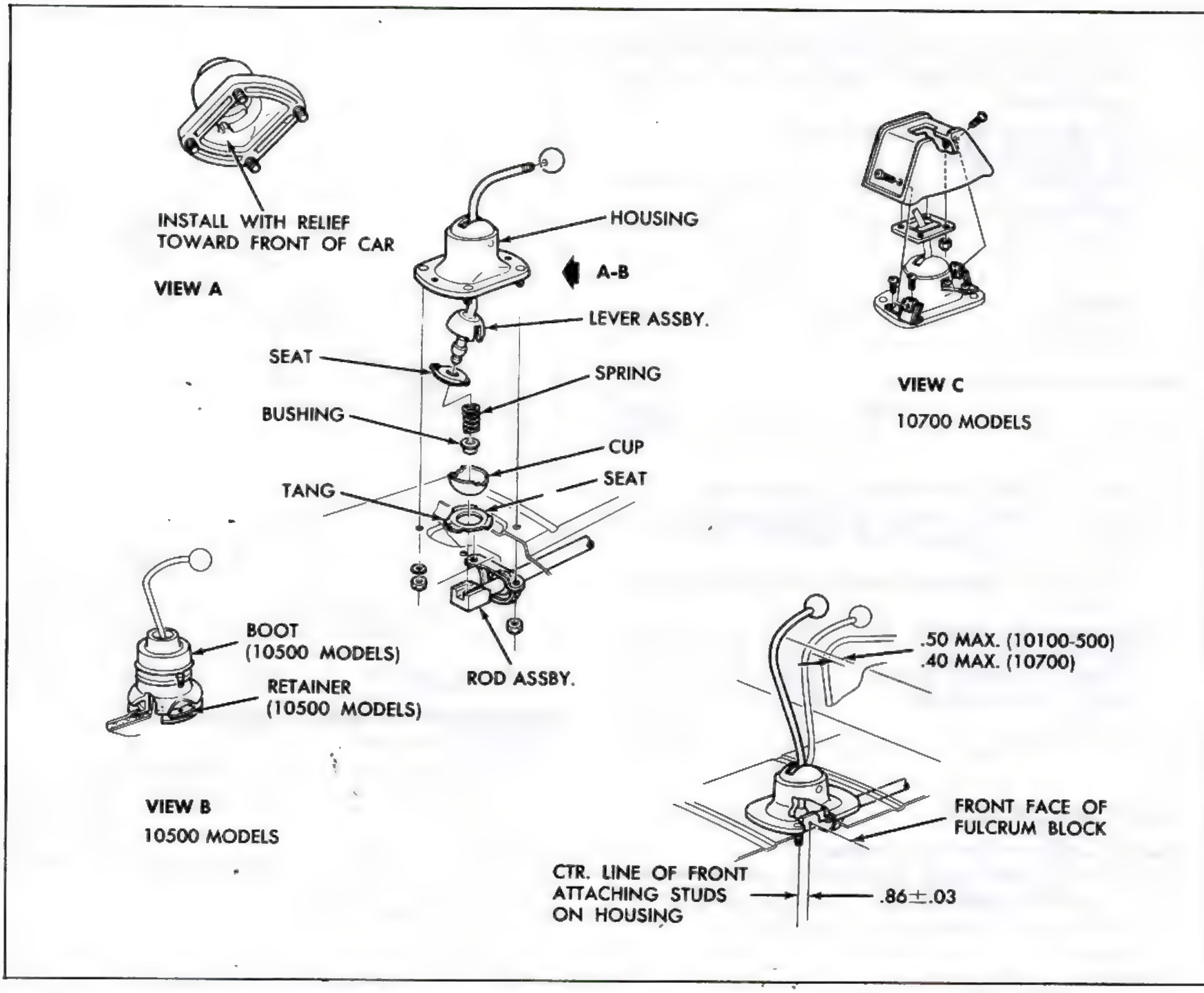


Fig. 7A-2—Gearshift Lever Assembly—Exploded View

the linkage should be inspected and readjusted as necessary. Whenever the transmission linkage has been disassembled for any reason, adjustment of the linkage should be checked on reassembly.

Perform transmission shift linkage adjustment to obtain proper positioning of the operator's gearshift control lever, as follows:

1. Move the vehicle front seat to its full-forward position.
2. Shift the transmission into the gear range used for checking control lever positioning. See illustration (fig. 7A-2).
3. To re[illegible] any lash from the system, push rearward lightly [illegible]e long shifter tube located in the tunnel.
4. Using a scale, check positioning of the gearshift control lever relative to front edge of seat or centerline of lever housing (refer to illustration for proper dimension).
5. If linkage readjustment is required, loosen the coupling clamp on the rear of the shifter tube and readjust rod length to obtain the correct control lever setting.
6. Retighten coupling clamp and test-shift transmission in all gear ranges.

SERVICE OPERATIONS

SERVICE OPERATIONS—TRANSMISSION IN VEHICLE

GEARSHIFT LEVER ASSEMBLY

Removal from Vehicle

1. Remove tunnel front plate.
2. Remove four nuts securing gearshift lever assembly to floor pan.

NOTE: The two rear nuts also secure the shift control shaft mounting bracket.

3. From the driver's compartment, lift the gearshift lever assembly up until its studs clear the floor pan, then remove the unit by lifting the floor mat at the center of seat.

Disassembly of Gearshift Lever Assembly

Refer to Figure 7A-2.

1. Unscrew the knob to remove, then clamp the gearshift housing in a vise.
2. Using a length of 1-1/2" pipe or J-5590, depress the retainer plate and rotate until its three lugs clear the lands in the gearshift housing, then remove the retainer.
3. Remove the lower spherical joint, spring, and seat, then pull lever out of housing.

Inspection and Repair

Inspect all working surfaces for wear and roughness. Repair or replace pieces as required. If broken, replace the spring.

Assembly of Gearshift Lever Assembly (Fig. 7A-2)

1. Apply Lubriplate generously to all working surfaces.
2. Place retainer plate on lower spherical and place the housing in a vise.
3. Place seat on gearshift lever with tab to right side of housing.
4. Place spring, bushing and cup on seat in housing.
5. Place retainer plate on cup, then compress the retainer and rotate laterally to engage its lugs in the housing with a length of 1-1/2" pipe or J-5590 if available.
6. Complete assembly by installing knob on shift lever.

SHIFT CONTROL SHAFT

Removal of Control Shaft from Vehicle

1. Remove tunnel cover and control shaft insulators.
2. To remove connecting pin, first remove cotter then remove pin by pushing out with channel lock pliers.
3. Separate the control shaft coupling from the transmission shifter shaft by pushing the control shaft toward the front of the car.
4. Complete removal of control shaft by removing two nuts attaching control shaft mounting bracket, then remove control shaft, coupling, and mounting bracket as an assembly.

Inspection and Repair

Coupling Replacement

1. To insure maintaining shift control adjustment, scribe the control shaft adjacent to the end of the coupling, then loosen the clamp bolt and remove old coupling.
2. Insert new coupling in shift control shaft until the end of the coupling is aligned with the mark scribed in Step 1. Rotate coupling so attaching pin hole at transmission end is vertical, then tighten clamp bolt.

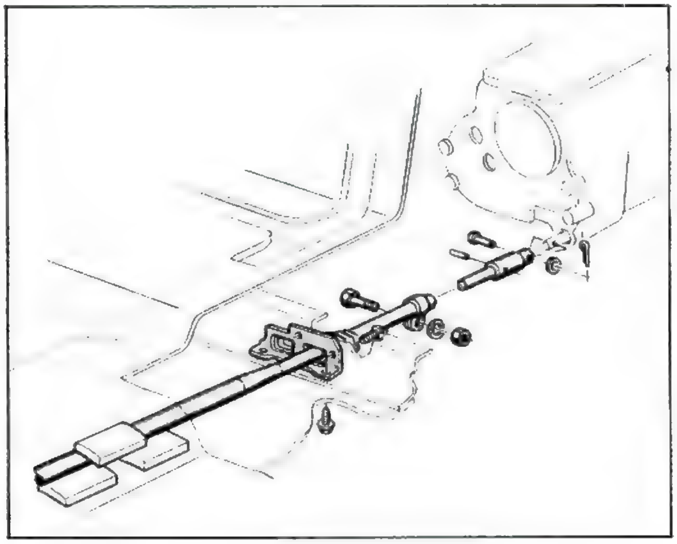


Fig. 7A-3—Control Rod & Linkage

Control Shaft Front Mounting Bracket or Bushing Replacement

1. Remove the coupling as previously described.
2. Slide bracket and bushing assembly (fig. 7A-2) off control shaft.
3. Reinstall bracket with reinforced side toward rear of shaft, then install coupling as previously covered.

Installation of Control Shaft in Vehicle

1. Center the shift lever ball, position and align the control shaft front bracket with the shift lever housing rear, then insert the bracket on its studs simultaneously with insertion of the control shaft socket onto the shift lever ball (fig. 7A-2). The control shaft socket should be well coated with Lubriplate prior to installation in vehicle.
2. Secure shaft bracket with two nuts.
3. Align control shaft coupling with transmission shifter shaft, then pull coupling over shifter shaft and install connecting pin and secure with cotter pin (fig. 7A-3).
4. Snap boot of shifter shaft seal into place in tunnel rear plate if loosened and it was not removed and install control shaft insulators and tunnel covers.

TRANSMISSION REMOVAL AND INSTALLATION

Instructions for the removal of the transmission from the vehicle are provided at the end of this Manual Transmission Section.

SERVICE OPERATIONS—TRANSMISSION REMOVED FROM VEHICLE

Disassembly of Transmission

1. Mount transmission in holding fixture J-7896 (fig. 7A-4).
2. Remove the front cover plate by removing four bolts and lock washers, then remove clutch gear bearing snap ring.
3. Remove the clutch gear and bearing with J-8361 as follows:

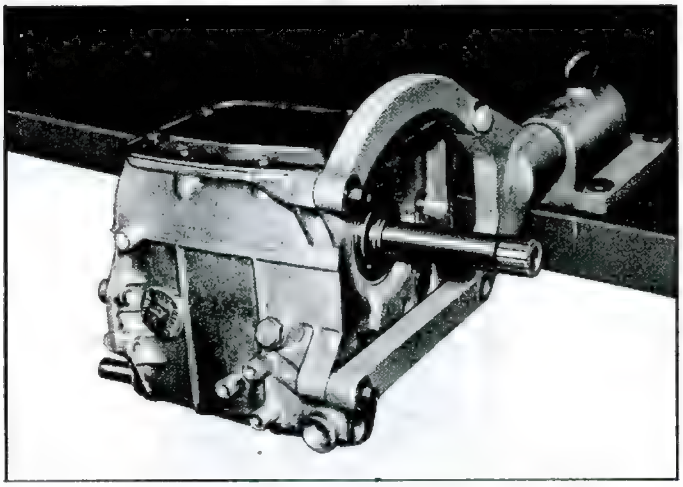


Fig. 7A-4—Transmission in Fixture J-7896

a. Disassemble J-8361 and install the adapter and screw assembly (fig. 7A-5) in slot in clutch gear hub.
b. Place dome over adapter and screw, being sure to index dome locating pins into screw holes in transmission case.
c. Loosen screws securing bearing snap ring fingers on dome assembly, place fingers between open ends of snap rings, then fully open snap ring with pliers (fig. 7A-6) and tighten finger screws to retain ring fully expanded.

CAUTION: Before opening snap ring, be sure ends are fairly well centered in recess in case. If ring is expanded when the ring ends are against either side of the recess, the snap ring radius can "hang" in the bearing groove and result in a broken case when the bearing is pulled.

d. Pull bearing and clutch gear by turning nut while holding screw with a wrench as shown (fig. 7A-7). Needle roller bearings will fall out when clutch gear is removed.

4. Remove transmission case top cover and gasket by removing eight screws and lock washers.
5. Remove snap ring from mainshaft groove. Snap ring is immediately behind mainshaft bearing as shown in Figure 7A-1.
6. Drive or press mainshaft out of transmission (fig. 7A-8).
7. Remove thrust washer, second speed gear, sliding gear, and second and third speed clutch from case by lifting out through top cover hole.
8. To remove the mainshaft bearing from the case, fully expand its snap ring and tap bearing out by driving on outer race (fig. 7A-9).
9. Remove countergear by driving out countershaft with J-5777 from the hole in the front of the case. A drift may be used instead of J-5777 but the needle bearings used at both ends of the countergear will be displaced which will require their restacking at assembly.
10. If replacement is anticipated, remove reverse idler gear. To remove, first drive the reverse idler shaft lock pin into the shaft, then drive the reverse idler shaft out of case with a drift from the through hole at the rear of case (fig. 7A-10). The expansion plug at the front of the case will be driven out by the reverse idler shaft. Remove the caged needle bearing and the thrust washer used at the rear of the reverse idler gear.
11. Remove detent cover and remove second and third gear detent spring and ball.
12. Drive out roll pin securing second and third shift fork (fig. 7A-11) to shaft, then tap out shaft with a drift to remove both fork and shaft.
13. Remove interlock from detent cavity with a magnet.
14. Remove first and reverse shift fork and shaft in the same manner as the second and third fork.
15. Remove first and reverse detent ball and spring.
16. Complete disassembly by removing two capscrew and lock washer assemblies securing shift finger

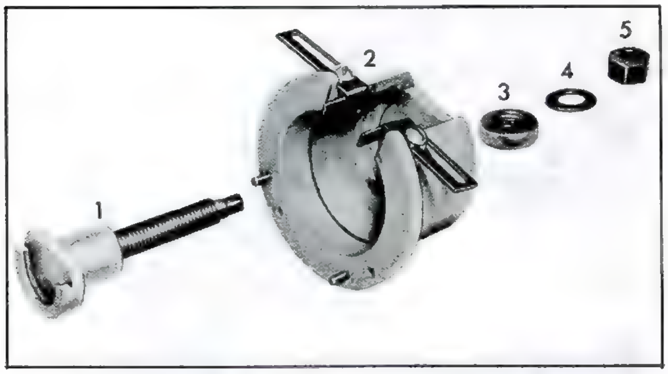


Fig. 7A-5—Clutch Gear Puller J-8361 Components

1. Adapter and Screw Assy.
2. Dome and Fingers
3. Bearing
4. Washer
5. Nut

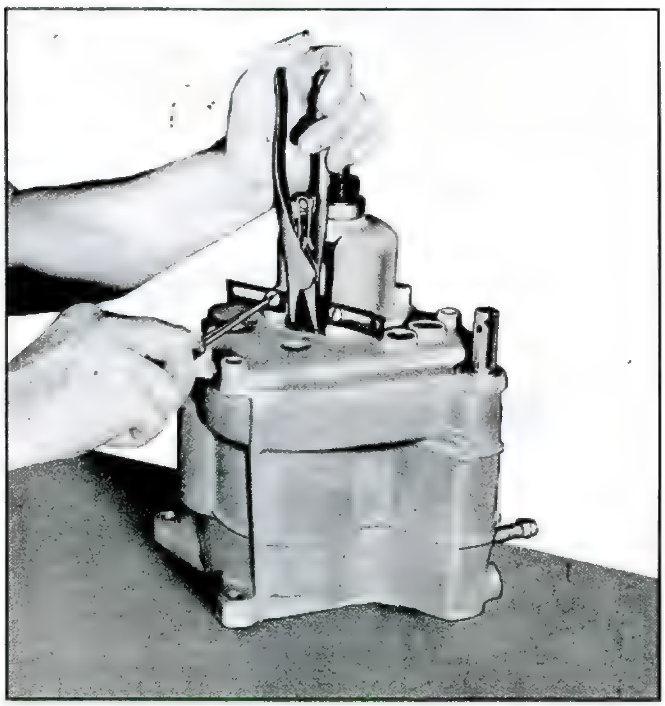


Fig. 7A-6—Locking Clutch Gear Retainer Expanded with J-8361

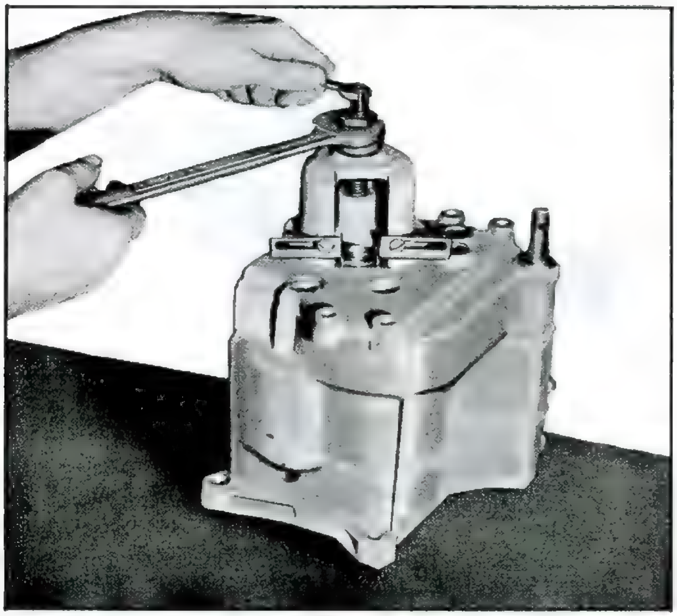


Fig. 7A-7—Pulling Clutch Gear and Bearing with J-8361

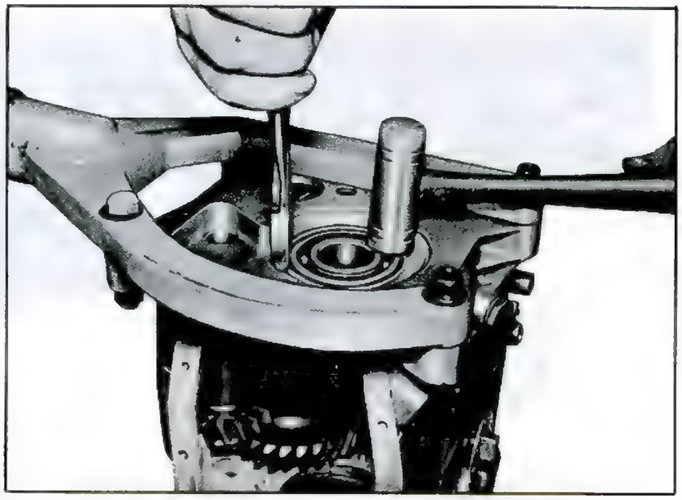


Fig. 7A-9—Removing Mainshaft Bearing from Case

(fig. 7A-12) to manual shift rod, then pull rod from case.

All transmission components are shown in Figure 7A-13.

Inspection and Repair

Bearings

1. Wash the bearings thoroughly in a cleaning solvent.
2. Blow out the bearings with compressed air.

   CAUTION: Do not allow the bearings to spin, but turn them slowly by hand. Spinning bearings will damage the race and balls.

3. After making sure the bearings are clean, lubricate them with light engine oil and check them for roughness. Roughness may be determined by slowly turning the outer race by hand.

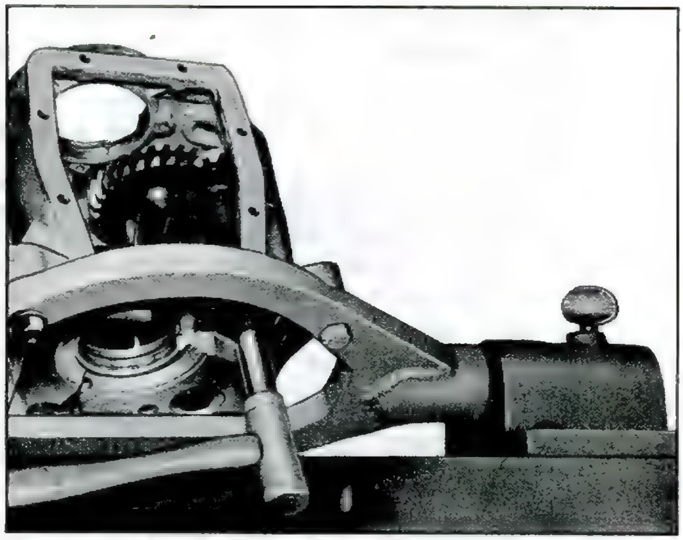


Fig. 7A-10—Removing Reverse Idler Gear

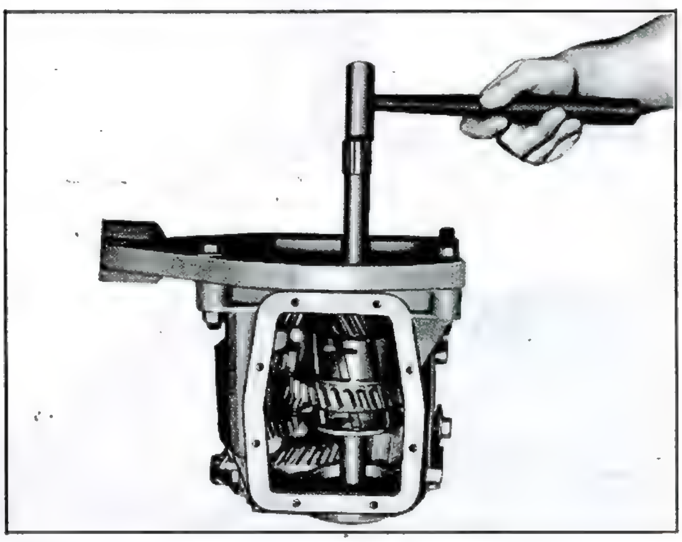


Fig. 7A-8—Driving Mainshaft from Transmission

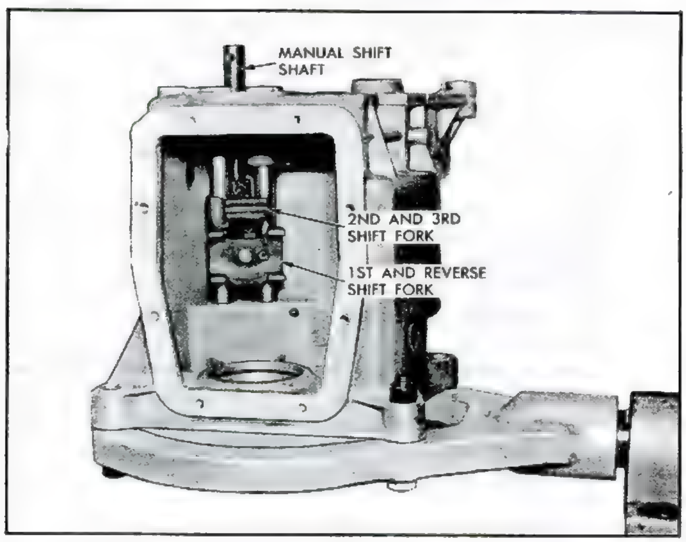


Fig. 7A-11—Shift Forks Installed

Transmission Case

Wash the transmission case inside and outside with a cleaning solvent and inspect for cracks. Inspect the faces for burrs and if any are present, dress them off with a fine cut mill file.

Gears

1. Inspect all gears and, if necessary, replace any that are worn or damaged.
2. Check the first and reverse sliding gear to make sure it slides freely on clutch sleeve.
3. Check the clutch sleeve to see that it slides freely on mainshaft.

Reverse Idler Gear Bushings

The bushings used in the idler gear are pressed into the gear then peened into holes in the bores to lock them into place, and are accurately bored with special diamond boring tools. This insures the positive alignment of the bushings and their shafts, as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushings are not serviced separately.

Check bushings for excessive wear by using a narrow feeler gauge between the shaft and the bushing. The proper clearance is from .002" to .004".

Countergear Needle Bearings

All countergear needle bearings should be inspected closely and if excessive wear shows, they should all be replaced as well as the shaft.

Clutch Gear Bearing Replacement

As the clutch gear and bearing are removed as a unit, it will be necessary to drive the clutch gear out of the bearing if replacement of either the gear or the bearing is required.

To remove, simply place outer race of bearing in a vise and tap out clutch gear with a soft hammer (fig. 7A-14).

NOTE: There should be no problem removing bearing as tolerance minimum is zero clearance.

Installation of new bearing can be accomplished by tapping or pressing new bearing onto clutch gear with a suitable socket used on the bearing inner race.

Clutch Sleeve and Synchronizer Rings

1. Remove the first and reverse sliding gear.
2. Turn the synchronizer ring in the clutch sleeve until the ends of the synchronizer ring retainer can be seen through the slot in the clutch sleeve.
3. Using J-0932 expand the snap ring into the counterbore in the clutch sleeve. This raises the snap ring from the groove in the synchronizer ring so the ring may be easily slipped out (fig. 7A-15).
4. Check the synchronizing cones for wear or for being loose in the clutch sleeve. If cones are damaged in any way, it will be necessary to replace the clutch sleeve and synchronizer ring assembly. Clutch sleeve should be replaced if there is more than .030" end play between cone and snap ring.
5. Inspect the synchronizer rings for smoothness.
6. Place the synchronizer rings in the synchronizing cones and check with thumbs to see that rings do not rock. Excessive rocking indicates a poor fit between the rings and cone, which will not permit proper synchronizing of gears during shifting.

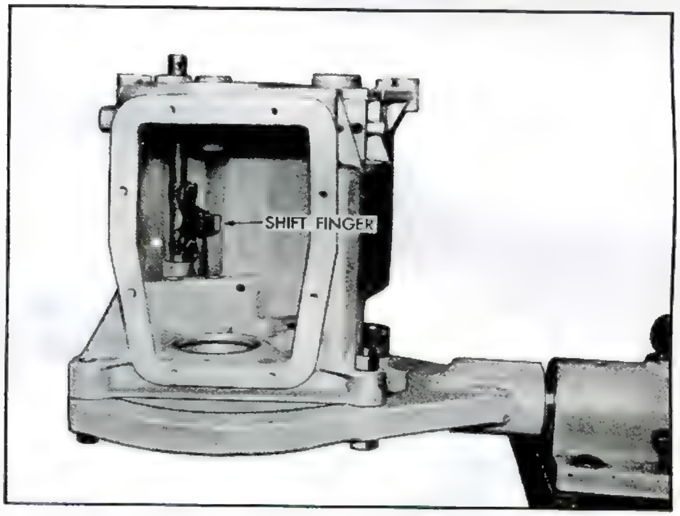


Fig. 7A-12—Manual Shift Rod Finger Installed

7. Install the synchronizer ring retainers in the counterbores in the ends of the clutch sleeves.
8. Using J-0932 in slot in clutch sleeve, expand each snap ring in the counterbore, lubricate each synchronizer ring with light oil and install in clutch sleeve.

NOTE: Make sure snap rings seat in groove all the way around the rings so synchronizer rings will turn freely.

9. Install the first and reverse sliding gear on the clutch sleeve.

Synchronizer Energizing Springs

1. It will be noticed upon examining these springs that one of the ends is slightly offset. Each spring must be assembled in its groove in the clutch gear and the second speed gear with the offset or locking end between the third and fourth teeth of either of the two banks of teeth on these gears, thus keeping the spring from turning in its groove (fig. 7A-16).
2. Under normal operation it should never be necessary to replace the energizing springs; however, should an energizing spring be removed for any reason, a new spring should be installed. The spring may be removed by slipping a thin blade under the spring and raising it sufficiently to slide it off over the clutch gear teeth.

CAUTION: Spring must be carefully installed so as not to expand it greater than the diameter of the clutch gear teeth as the spring will set.

Assembly of Transmission

1. Mount transmission case in J-7896.
2. Lubricate manual control shaft with oil, then insert through seal in case. Position actuating finger and secure to shaft with two lock tabs and capscrews. Bend lock tabs onto heads of screws.
3. Install detent spring and ball (fig. 7A-17) in that order in detent cavity. Tap ball and spring to insure the spring is resting on bottom of cavity.

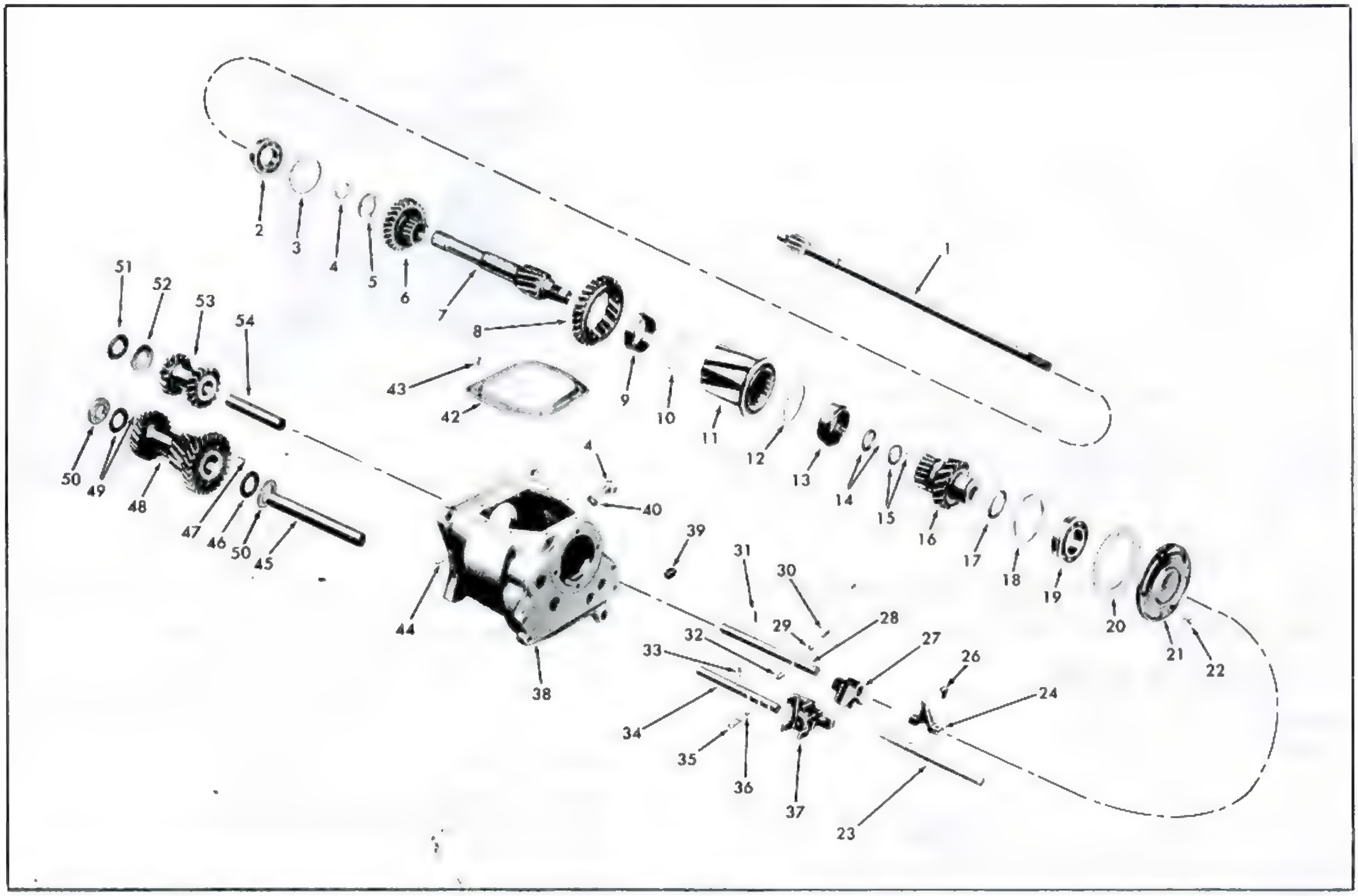


Fig. 7A-13—Manual Transmission—Exploded View

1. Input Shaft
2. Mainshaft Bearing
3. Mainshaft Bearing Retaining Ring
4. Snap Ring (Selective)
5. Thrust Washer
6. Second Speed Gear
7. Mainshaft
8. First and Reverse Sliding Gear
9. Synchronizer Ring
10. Snap Ring
11. Second and Third Speed Clutch
12. Snap Ring
13. Synchronizer Ring
14. Mainshaft Rear Pilot Bearings and Spacer
15. Mainshaft Front Pilot Bearings and Spacer
16. Clutch Gear
17. Snap Ring
18. Clutch Gear Bearing Retaining Ring
19. Clutch Gear Bearing
20. Front Cover Gasket
21. Front Cover
22. Front Cover Mounting Bolt (4 Used)
23. Manual Shift Selector Shaft
24. Shift Finger
26. Shift Finger Attaching Bolt and Lock Washer Assembly
27. Second and Third Speed Shift Fork
28. Second and Third Speed Shift Fork Shaft
29. Detent Ball
30. Detent Spring
31. Roll Pin
32. Interlock
33. Roll Pin
34. First and Reverse Shift Fork Shaft
35. Detent Spring
36. Detent Ball
37. First and Reverse Fork
38. Transmission Case
39. Pipe Plug (2 Used)
40. Detent Cap Gasket
41. Detent Cap
42. Top Cover
43. Top Cover Attaching Screws (8 Used)
44. Reverse Idler Gear Shaft Lock Pin
45. Countergear Shaft
46. Countergear Front Needle Thrust Bearing Washer
47. Countergear Front Needle Bearings
48. Countergear
49. Countergear Rear Needle Bearings and Thrust Washer
50. Thrust Washer
51. Reverse Idler Gear Bearing Race
52. Reverse Idler Gear Bearing (Torrington)
53. Reverse Idler Gear
54. Reverse Idler Shaft

4. Insert first and reverse fork shaft through case, slip fork on shaft, and secure fork to shaft with roll pin (fig. 7A-18).
5. Install interlock in detent cavity (fig. 7A-19).
6. Insert second and third fork shaft through case and slip fork (fig. 7A-20) onto shaft. Twist shaft so its interlock groove is 90-degrees from the interlock, then fully insert shaft and twist the shaft so the interlock notch is engaged by the interlock. Now secure shift fork to shaft with roll pin.
7. Insert detent ball and spring for second and third shift fork, then install detent cavity cover and gasket.
8. Place some cup grease in the roller bearing area of each end of the countergear and install the 25 rollers in each end. The grease will hold the rollers in place while installing (fig. 7A-21).
9. Insert J-5777 in countergear.
10. Apply grease to bearing thrust washers and countergear thrust washer and place one of each at each end of countergear. Tab on each thrust washer should be positioned so as to align with notches in case.
11. Insert the countergear (with J-5777) in transmission case and rest it on bottom of case.

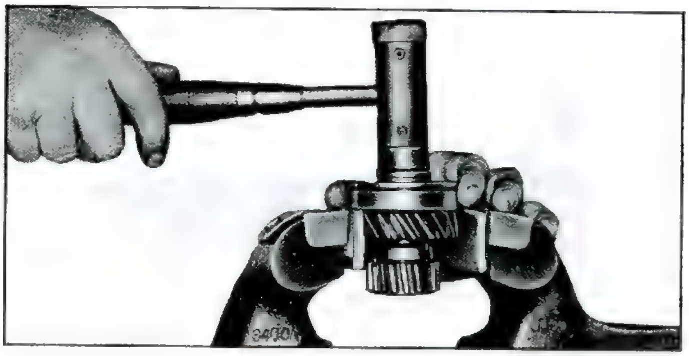


Fig. 7A-14—Removing Clutch Gear Bearing

12. Lubricate and insert countergear in case, align countergear with shaft being sure thrust washer tabs engage case notches and tap shaft through, pushing assembly Tool J-5777 out of case (fig. 7A-22). The shaft fit is a slight press at the front of the case. Tap the countershaft into the case until its higher step is flush with the rear face of the case. Stake the shaft in one place at the rear of the case (adjacent to the lower step of the countershaft) and at three places equally spaced at the front of the case.

NOTE: In the "Corvair", the final installed position of the flat on the countergear shaft is unimportant. The flat occurs only because the shaft is common to conventional production transmissions.

Fig. 7A-15—Removing Synchronizer Ring with J-932

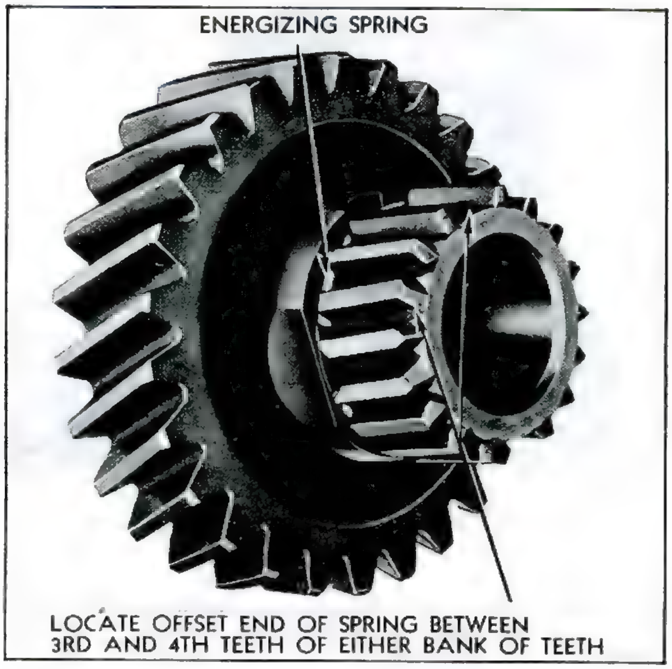


Fig. 7A-16—Position of Energizing Spring

13. Coat thrust washer and the needle thrust bearing with grease and position them on reverse idler gear; needle bearing against end (rear) with chamfered gear teeth (fig. 7A-23). Coat bushings with transmission lubricant.
14. Place reverse idler gear assembly in position in case so washer and thrust bearing are toward rear.
15. Install the reverse idler shaft from rear, making sure the lock pin hole in the shaft lines up with the hole in the case at the same angle (fig. 7A-23).
16. Use a new idler shaft lock pin and drive it in approximately 1/16" beyond flush with case.
17. Install mainshaft rear bearing in case by tapping on O.D. of bearing until bearing contacts retainer ring

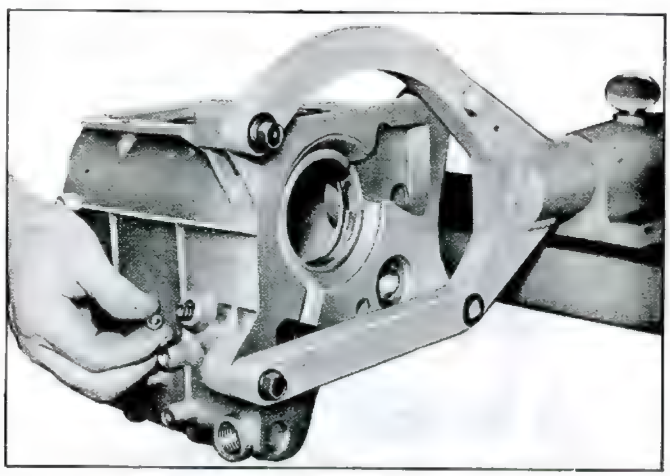


Fig. 7A-17—Installing Detent Spring and Ball for First and Reverse Shift Fork Shaft

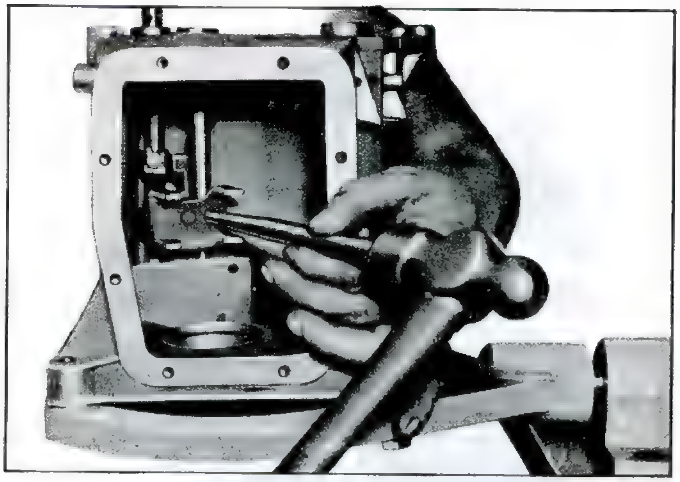


Fig. 7A-18—Installing First and Reverse Shift Fork

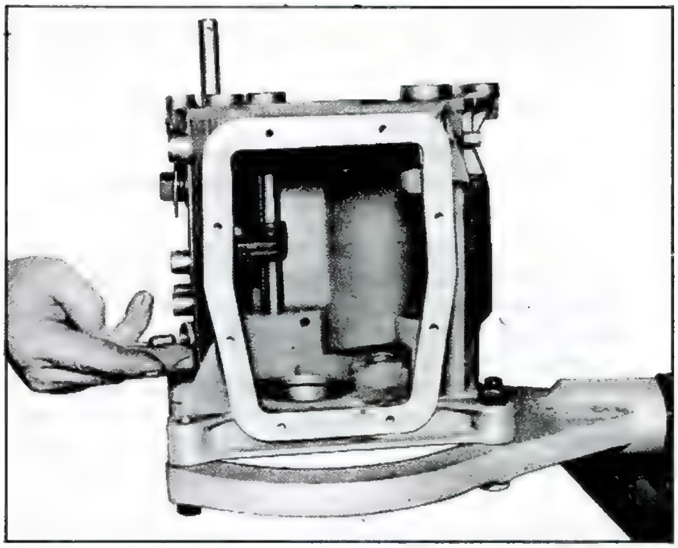


Fig. 7A-19—Installing Shift Forks Interlock

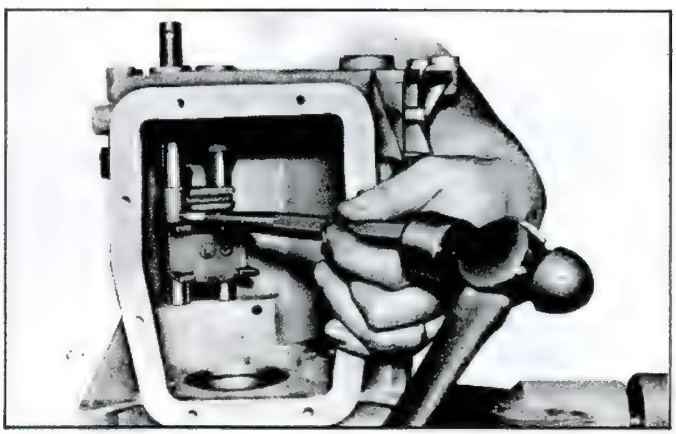


Fig. 7A-20—Installing Second and Third Shift Fork

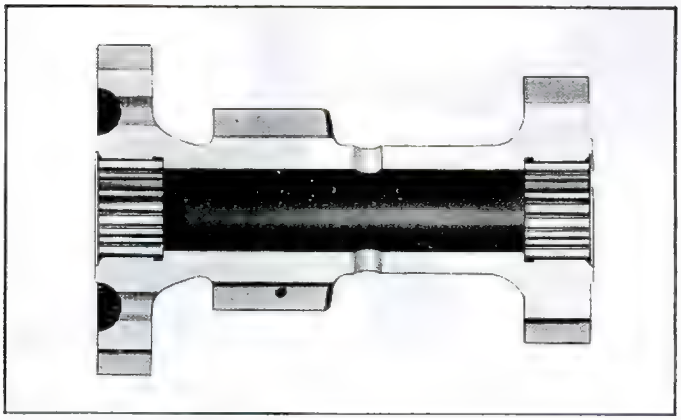


Fig. 7A-21—Countergear Bearings Installed

in case. Then expand retainer and tap bearing until retainer ring seats in bearing groove (fig. 7A-24).

18. Install sliding gear (4, fig. 7A-25) on second and third speed clutch (3).
19. Install second speed gear (5, fig. 7A-25) in second and third speed clutch.
20. Place assembled second and third speed clutch, sliding gear and second speed gear in case (fig. 7A-26).
21. From the front, insert the mainshaft through the bores of the second and third speed clutch and second speed gear, then install the thrust washer on the mainshaft with its oil grooves toward the gear.

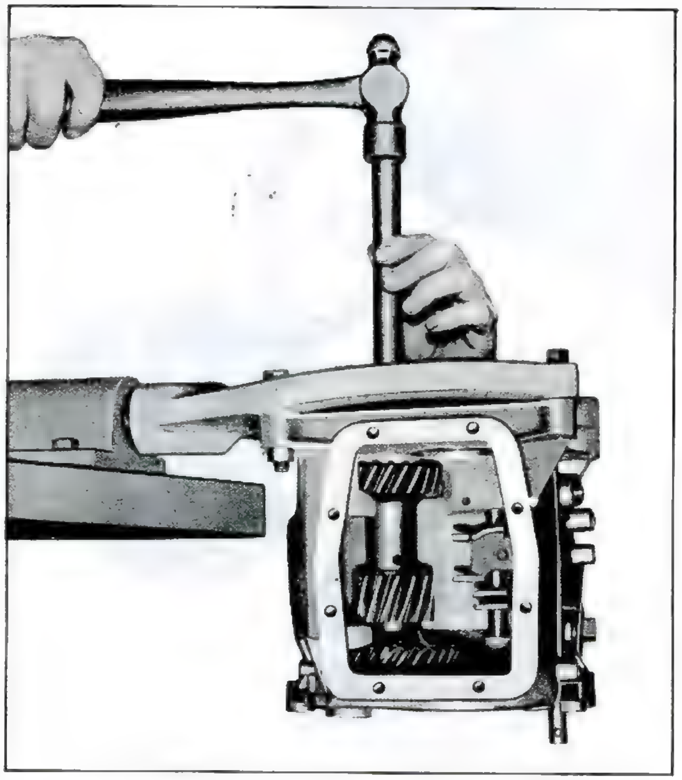


Fig. 7A-22—Installing Countershaft in Countergear

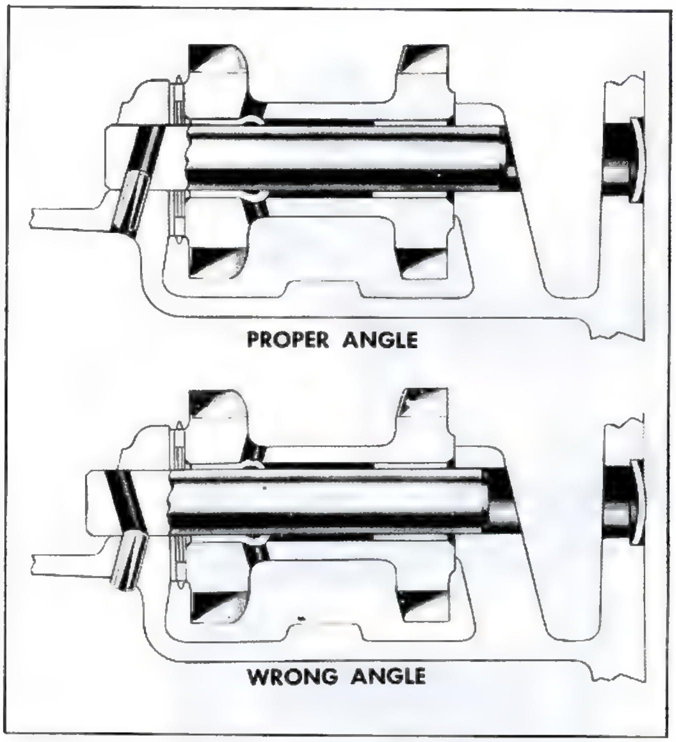


Fig. 7A-23—Reverse Idler Gear Installation Showing Lock Pin Alignment

22. Tap the front of the mainshaft until the ring groove is accessible behind the rear bearing and install the snap ring.

23. Check fit of snap ring at front of mainshaft (installed in previous step) by inserting feeler stock between snap ring and bearing inner race. Final end clearance must be .004" maximum, therefore change to applicable thickness thrust washer if original does not meet this limit. Washers are available in four (4) thicknesses, ranging from .086" to .097".

24. Place some cup grease in the mainshaft pilot hole of the clutch gear and install roller bearings and small spacer. Then install the large spacer and remaining roller bearings (fig. 7A-27).

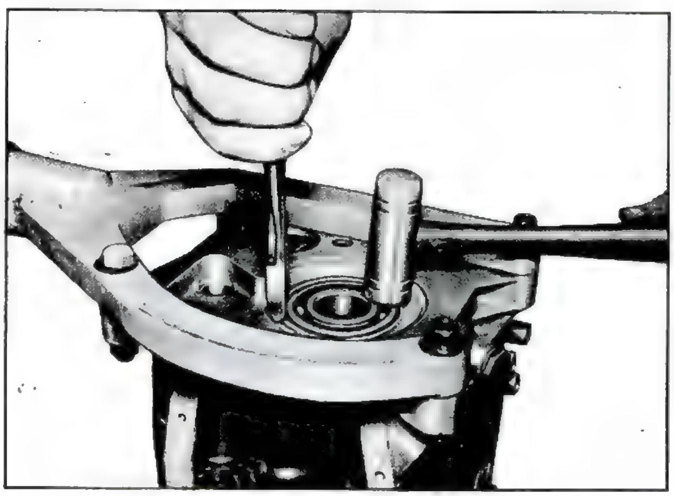


Fig. 7A-24—Installing Mainshaft Rear Bearing

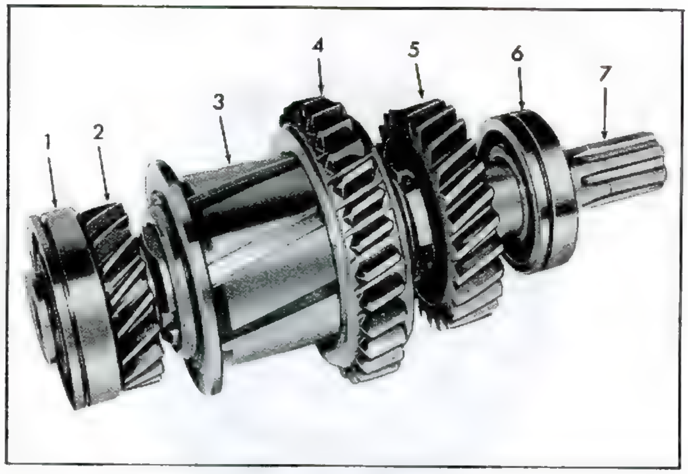


Fig. 7A-25—Mainshaft Components

1. Clutch Gear Bearing
2. Clutch Gear
3. Second and Third Speed Clutch
4. First and Reverse Sliding Gear
5. Second Speed Gear
6. Mainshaft Bearing
7. Mainshaft

25. Align the synchronizer lands with the clutch gear blank teeth (fig. 7A-27). Install smaller snap ring in clutch gear.

26. Tap the clutch gear bearing into the case, then open retainer ring and fully seat bearing as indicated by seating of the retainer ring in the bearing groove (fig. 7A-28).

27. Install the front cover plate and gasket and secure with four screws.

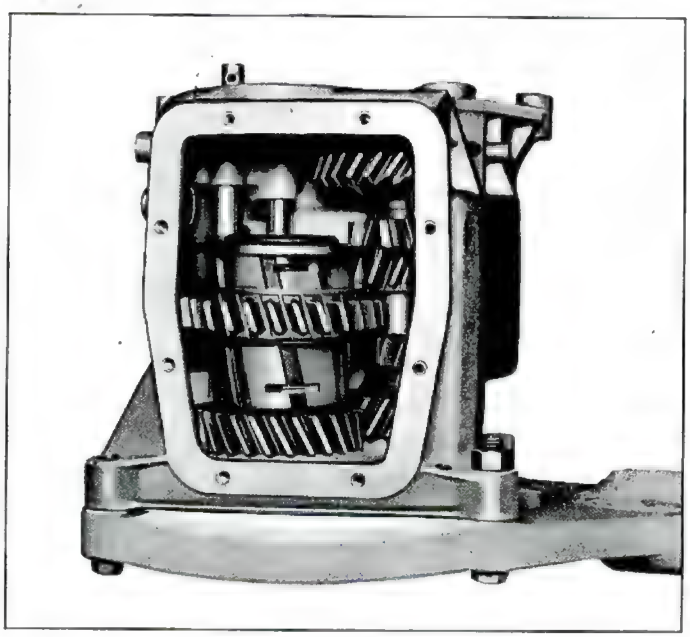


Fig. 7A-26—Second and Third Speed Clutch, Sliding Gear and Second Speed Gear Installed

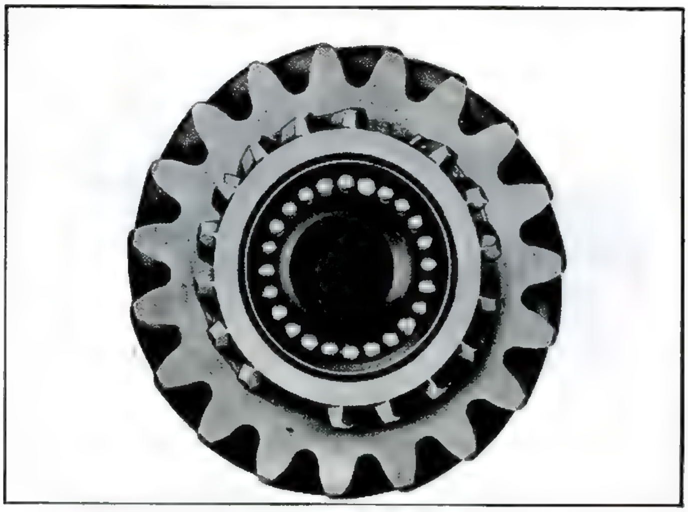


Fig. 7A-27—Mainshaft Pilot Bearings in Clutch Gear

28. Install top cover and gasket and secure with eight screws.

29. Install expansion plugs in the case openings at the rear of the manual shift shaft and front of the reverse idler shaft.

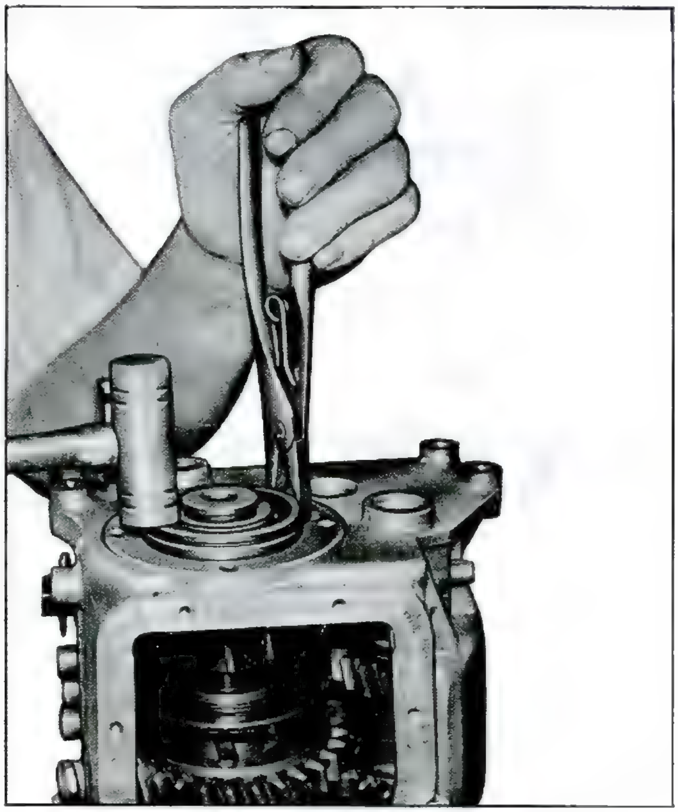


Fig. 7A-28—Installing Clutch Gear Bearing

FOUR SPEED TRANSMISSION

INDEX

GENERAL DESCRIPTION

The Corvair four-speed transmission (fig. 7B-1) is of the helical gear, constant mesh type to provide full synchronization in all forward gears. Spur gears on the mainshaft and countershaft are engaged by a small sliding spur gear to provide reverse. Reverse is not synchronized.

Like the Corvair three-speed, the four-speed mainshaft is hollow to permit passage of the clutch shaft forward to the clutch gear. The mainshaft is supported at the front in a double row of needle bearings carried by the clutch gear and at the rear by a ball bearing race. In turn, the clutch gear is carried in the front of the case by a ball bearing race.

The countergear is of a single piece construction and is carried on double rows of needle bearings at each end. Thrust washers are used both front and rear between the countergear and the transmission case. A slight press fit is used at the front of the countershaft to retain the shaft and to prevent lubrication loss at this point.

Vehicle shift components are comparable to those used with the Corvair three-speed transmission. A long shift tube supported by a nylon bushed bracket in the tunnel spans the distance between the driver's compartment and the front of the transmission. At the front, the tunnel shift tube carries a ball socket to receive the lower end of the gearshift lever. A rubber sleeved coupling is secured by a clamp nut to the tunnel shift tube at the rear to provide attachment to the transmission shift rod and to provide a means of adjusting the length of the tunnel tube for linkage adjustment. Thus, by moving the gearshift lever, shift tube motion is provided both fore and aft and laterally.

In the transmission, three shift fork rods are mounted parallel above the transmission shift rod which is attached to the tunnel shift tube. The transmission shift rod carries a finger which extends upward to engage the shift forks. As the three forks are mounted on parallel rods, a slight rotation of the shift rod moves the shift finger from the 1-2 fork in the center to the 3-4 fork which is outboard. To engage the reverse shifter head, which is mounted on the inboard shaft, the shift finger must be moved laterally against a spring-loaded plunger at the neutral crossover point. The plunger is required to prevent accidental shifting into reverse while in motion as the 1-2 fork has a gate to permit passage of the shift finger through it to reach reverse.

MAINTENANCE AND ADJUSTMENTS

LUBRICATION

Common lubricant, specified in Section 0 is used in the four-speed transmission and differential carrier so no oil seals are used between these units. Actually there is some interchange of lubricant as a lubricant dam is formed at the transmission which prevents entrapment of excess lube in the carrier sump which is below the transmission level, thus maintaining transmission lubrication on upgrades.

Oil Level Check

Periodically check the lubricant of the four-speed Transaxle by removing the filler plug in the differential carrier. If oil is at the level of carrier filler plug, both the carrier and transmission lubricant levels are satisfactory. If oil is below filler plug, add oil to the carrier as required, then check the lubricant level in the transmission by removing its filler plug. Replenish as necessary.

CAUTION: Under no circumstances should any lubricant containing active sulphur be used. Also, do not use mineral oil. Only lubricant specified in Section 0 should be used.

Oil Change

To change oil, drain both the differential carrier and four-speed transmission by removing the drain plug provided in each. Reinstall the drain plugs and refill each unit to the level of the filler plugs with Lubricant specified in Section 0.

SHIFT LINKAGE ADJUSTMENT

After any service operation in which the shift control rod in the tunnel has been replaced or it has been found that transmission response is improper to the shift pattern, adjust the shift linkage.

1. Shift the transmission to fourth, then loosen the coupling clamp nut (fig. 7A-3) on the tunnel shift

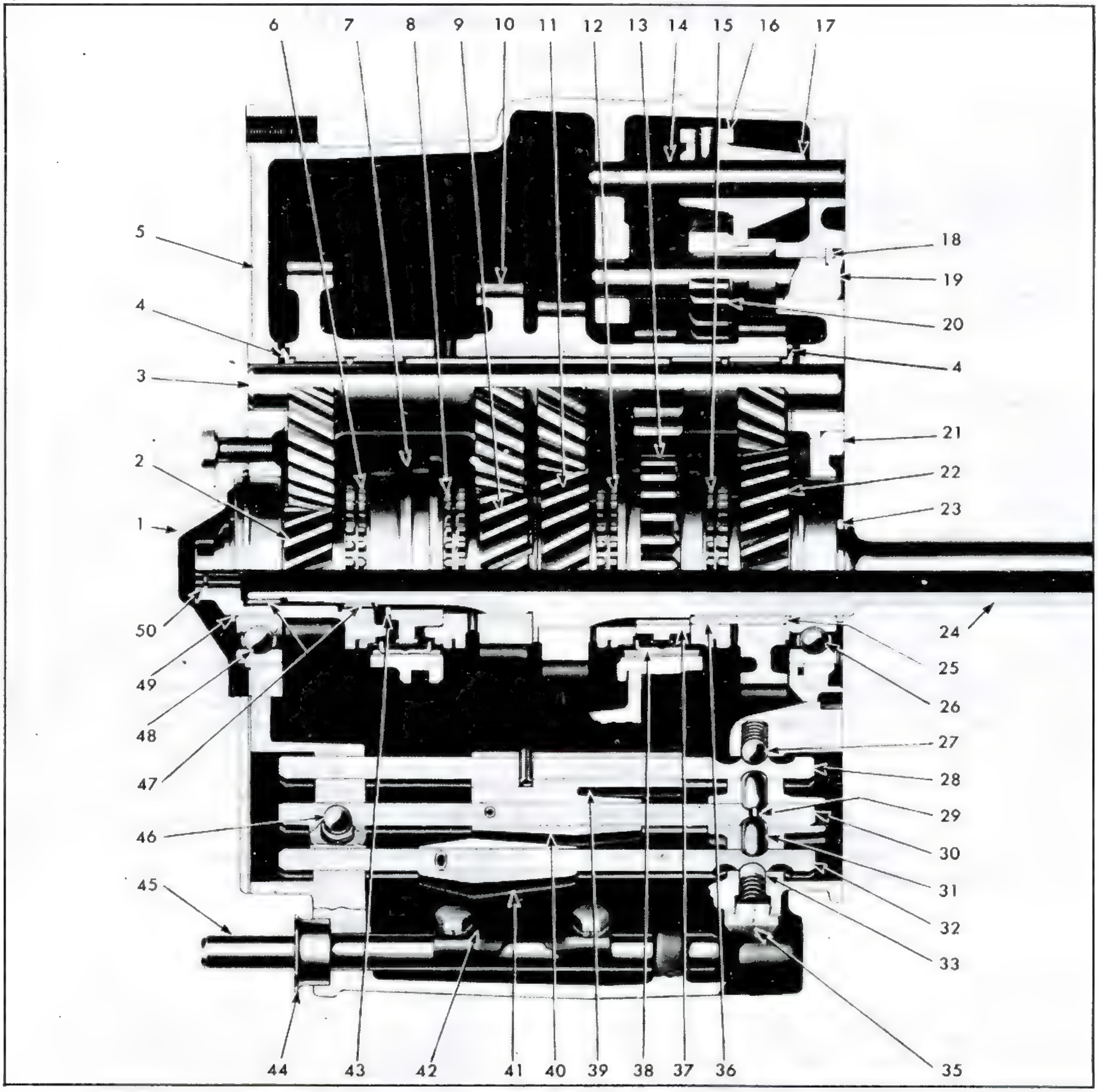


Fig. 7B-1—Corvair Four-Speed Transmission—Cross Sectional View

1. Clutch Gear Bearing Cover
2. Clutch Gear
3. Countershaft
4. Countergear Thrust Washer
5. Transmission Case
6. 4th Blocker Ring
7. 3-4 Shift Collar
8. 3rd Blocker Ring
9. Third Gear
10. Countergear
11. Second Gear
12. 2nd Blocker Ring
13. 1-2 Shift Collar (with Integral Reverse Spur Gear)
14. Reverse Shift Fork Shaft
15. 1st Blocker Ring
16. Reverse Shifter Lever
17. Reverse Shift Fork
18. Woodruff Key
19. Reverse Idler Gear Shaft
20. Reverse Idler Gear
21. Rear Bearing Retainer
22. First Gear
23. Rear Bearing Selective Snap Ring
24. Mainshaft
25. First Gear Thrust Washer
26. Rear Bearing
27. Reverse Shifter Head Shaft Detent Ball and Spring
28. Reverse Shifter Head Shaft
29. Interlock Pin
30. 1-2 Shift Fork Shaft
31. Interlock
32. 3-4 Shift Fork Shaft
33. 3-4 Shift Fork Shaft Detent Ball and Spring
35. 3-4 Detent and Interlock Channel Cap
36. First Gear Sleeve
37. 1-2 Synchronizer Hub
38. Synchronizer Key
39. Reverse Shifter Head
40. 1-2 Shift Fork
41. 3-4 Shift Fork
42. Shift Finger
43. Special Snap Ring
44. Shifter Shaft Seal
45. Shifter Shaft
46. 1-2 Shift Fork Shaft Detent Ball and Spring
47. Mainshaft Roller Bearings (34 Front-38 Rear)
48. Clutch Gear Bearing
49. Clutch Gear Bearing Snap Ring
50. Snap Ring (Input Shaft Bottoming Stop)

tube. Move the vehicle front seat to its full forward position.
2. Move the gearshift lever its full limit rearward in fourth or until it is resting against the edge of the seat, then tighten the coupling clamp nut on the tunnel tube. The shift lever will not touch when a person's weight is on the seat.
3. Test shifts in all ranges.

SERVICE OPERATIONS

SERVICE OPERATIONS—TRANSMISSION IN VEHICLE

GEARSHIFT LEVER ASSEMBLY

The removal, overhaul, and installation procedures for the four-speed gearshift lever are identical to those provided earlier in this section for the three-speed transmission. However, the four-speed gearshift lever does not embody the seat (fig. 7A-2) used in three-speed gearshift levers.

SHIFT CONTROL ROD

The removal, overhaul, and installation procedures for the four-speed transmission shift control rod are identical to those used for the three-speed transmission which are provided earlier in this section.

TRANSMISSION REMOVAL AND INSTALLATION

Instructions for the removal of the transmission from the vehicle are provided at the end of this Manual Transmission Section.

SERVICE OPERATIONS—TRANSMISSION REMOVED FROM VEHICLE

Disassembly of Transmission

1. Remove six bolts securing front cover and eight bolts securing side cover and remove covers from case.
2. Remove plug, detent spring, and ball from 3-4 detent channel (fig. 7B-2) at the left-rear of the case.
3. Shift the 3-4 shift fork (fig. 7B-3) into fourth gear (full forward), then drive roll pin from shift fork with a pin punch. Remove 3-4 shift shaft with a drift and remove fork. Shaft can be driven from case in either direction.
4. Remove plug, spring, and detent ball from 1-2 detent channel at front of case adjacent to shifter shaft.
5. Move 1-2 shift fork (fig. 7B-3) into second gear (full forward), then remove roll pin securing fork to shaft with a pin punch. Remove shift fork and shaft by tapping shaft out of case in either direction.
6. Remove the snap rings located in the clutch gear bore, between the clutch gear and bearing, and between the clutch gear bearing and case (fig. 7B-4).
7. Install clutch bearing puller J-8880 as follows:
   a. Assemble puller plates J-8880-1 (fig. 7B-5) onto clutch gear bearing by inserting plates into the bearing groove, then secure puller plates together with two screws.
   b. Insert adapter plug J-8880-2 into bore of clutch gear.
   c. Attach body J-8111-3 to puller plates with two 1/2"-13 x 2-1/2" screws and two 1/2" flat washers. Back out large puller screw in body as required to permit attachment of body to puller plates with these screws.
   d. Remove the clutch gear bearing by turning puller screw in J-8880 as shown (fig. 7B-5). Separate puller plates from bearing.
8. Remove two rear bearing retainer snap rings. Remove mainshaft with assembled gears and rear bearing retainer as shown in Figure 7B-6. It may be necessary to jiggle the output shaft, making sure the clutch gear does not separate from mainshaft. After removal of mainshaft from transmission, shift synchronizer sleeves to neutral.

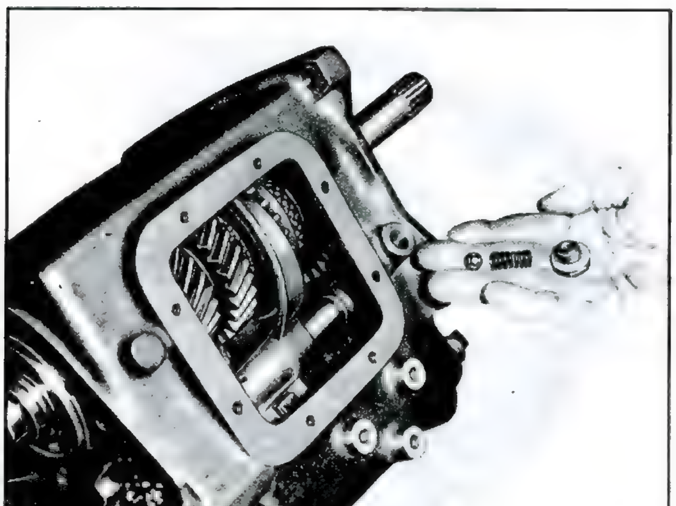


Fig. 7B-2—Removing 3-4 Shift Fork Detent Components

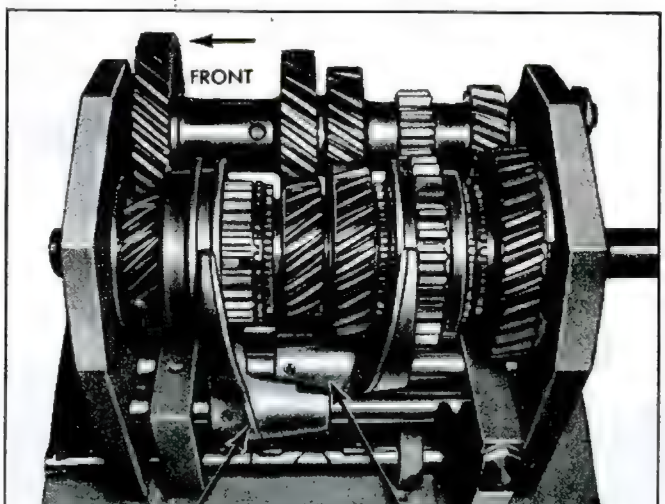


Fig. 7B-3—Shift Forks Installed

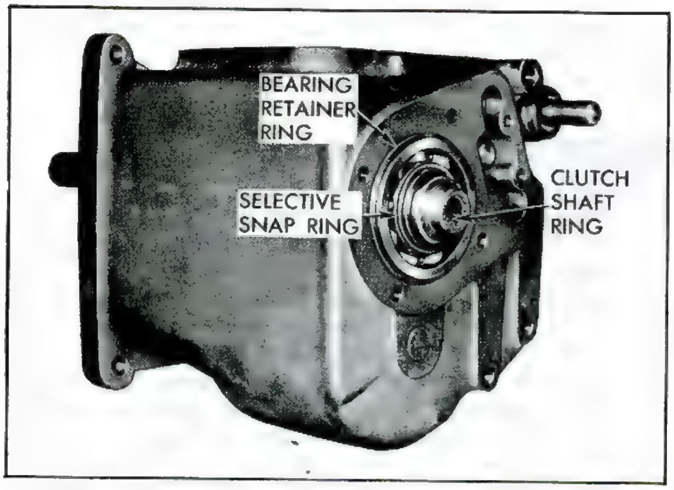


Fig. 7B-4—Clutch Gear and Bearing Snap Rings

9. Using a pin punch, drive roll pin from reverse shifter head (fig. 7B-7), then remove shifter head and shaft from case by tapping shaft out in either direction with a drift.
10. Drive out reverse idler gear and reverse shifter fork shafts from the case by driving rearward with a drift. Use care not to lose Woodruff key used in reverse idler gear shaft. Remove idler gear and reverse shifter fork (fig. 7B-7) from case.
11. Remove reverse shifter lever (fig. 7B-7) by lifting off its pin in the case.
12. To remove the countergear, improvise a dummy shaft by cutting a 7" length of 9/16" roll stock, then drive countershaft rearward using the dummy shaft until the countershaft is fully disengaged from the case and the dummy shaft is fully within the countergear (fig. 7B-8). Carefully remove the countergear and dummy shaft from the case, using care not to tip countergear to prevent needle bearings from falling out.

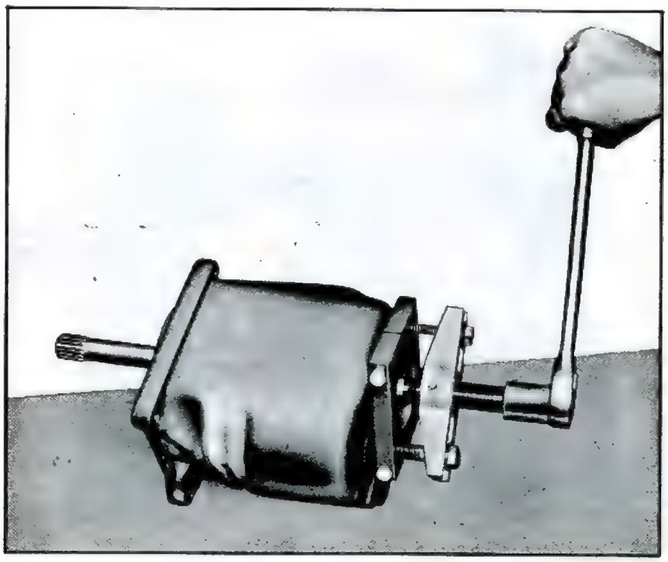


Fig. 7B-5—Removing Clutch Gear Bearing with Puller J-8880

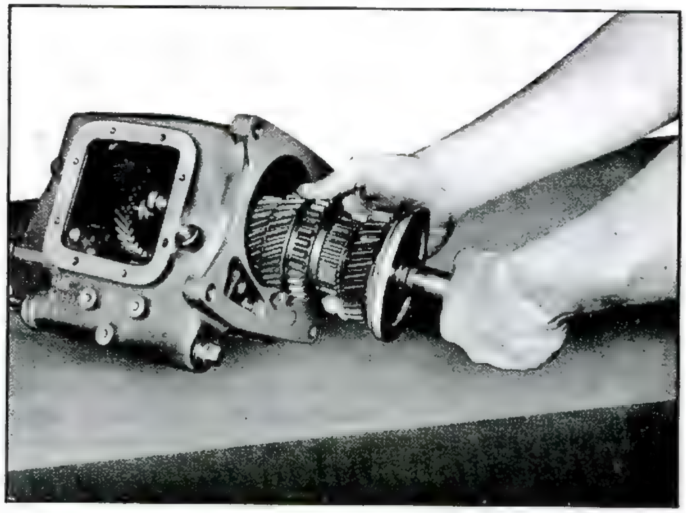


Fig. 7B-6—Removing Assembled Mainshaft Components

13. Remove two countergear thrust washers from case.
14. Using a magnet or by tipping the case, remove the two interlocks, pin, and the detent ball and spring remaining in the 3-4 detent channel.
15. Remove two screws and lock washer assemblies attaching shift finger to selector shaft, then remove shifter shaft plug in rear of case. Tap shaft rearward from case out through hole with a drift.
16. If necessary remove two plugs securing reverse inhibitor springs and ball to case and remove inhibitor. This completes disassembly of transmission.

Disassembly of Mainshaft

1. Place clutch gear downward against table top and carefully lift mainshaft out of clutch gear to prevent disturbing mainshaft roller bearings.
2. Remove special snap ring from front of mainshaft, then slide 3-4 synchronizer unit with blocker rings and third speed gear from mainshaft (fig. 7B-9).

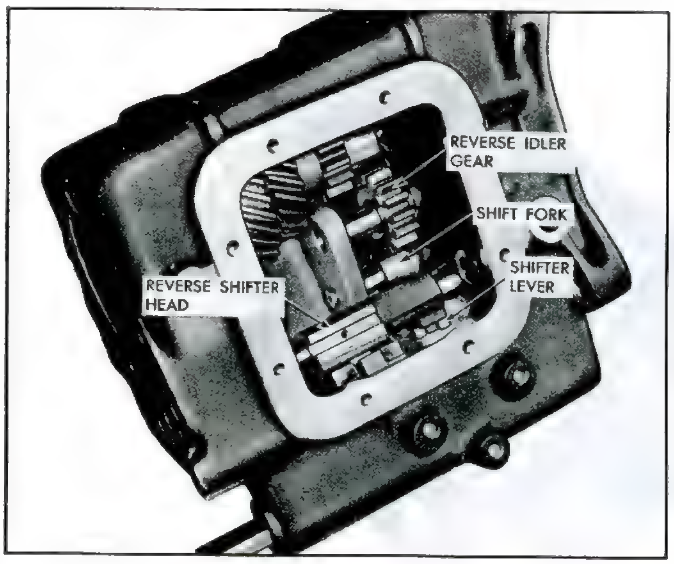


Fig. 7B-7—Reverse Components—Installed View

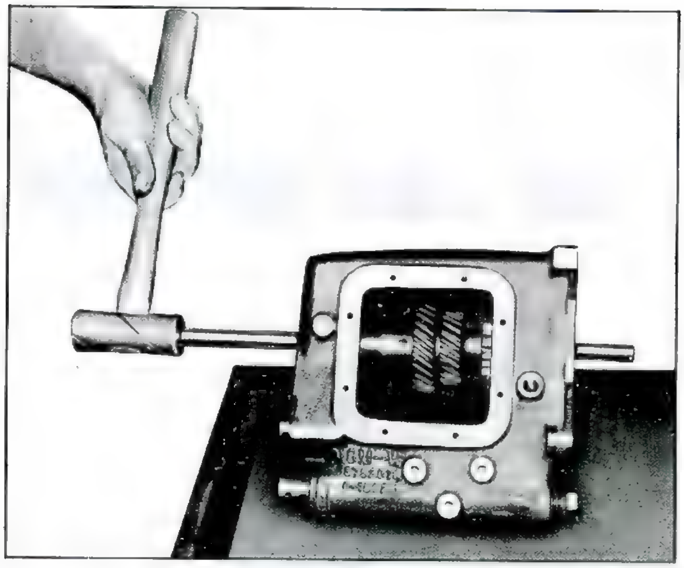


Fig. 7B-8—Removing Countergear Shaft with Dummy Shaft

3. Remove rear bearing selective snap ring, then remove rear bearing and retainer as an assembly (fig. 7B-10).
4. Remove first speed gear thrust washer, first speed gear, and a 1st speed blocker ring.
5. Press mainshaft out of 1-2 synchronizer unit and first speed gear sleeve. Remove 2nd speed blocker ring and second speed gear. This completes disassembly of main shaft.

Inspection and Repair

Transmission Case

Wash the inside and outside of the transmission case with a cleaning solvent and inspect for cracks. Inspect the rear face which fits against differential carrier for burrs and if any are present, dress them off with a fine mill file.

Also check the condition of the shifter shaft seal and replace if necessary.

Front and Rear Bearings

1. Wash the front and rear bearings thoroughly in a cleaning solvent.
2. Blow out bearings with compressed air.

   CAUTION: Do not allow the bearings to spin, but turn them slowly by hand. Spinning bearings will damage the race and balls.

3. Make sure the bearings are clean, then lubricate them with light engine oil and check them for roughness. Roughness may be determined by slowly turning the outer race by hand.

Bearing Rollers and Spacers

All mainshaft and countergear bearing rollers should be inspected closely and replaced if worn. Inspect countershaft and mainshaft at the same time and replace if necessary. Replace all worn spacers.

Gears and Thrust Washers

Inspect all gears and thrust washers and, if necessary, replace all that are worn or damaged.

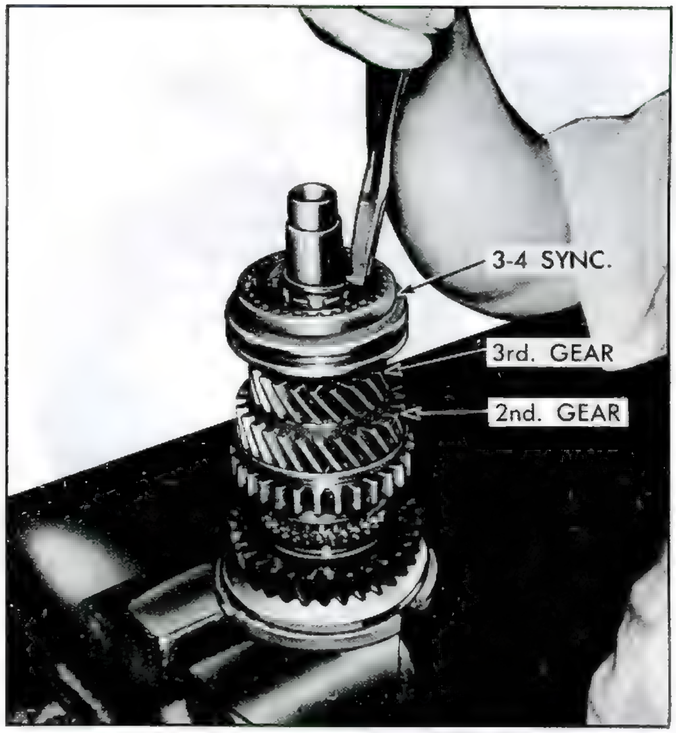


Fig. 7B-9—Mainshaft Front Components

Clutch Keys and Springs Replacement

NOTE: The clutch hubs and sliding synchronizer sleeves are a matched assembly and should be kept together as originally assembled, but the three keys and two springs may be replaced if worn or broken.

1. Push the hub from the sliding sleeve. The keys will fall free and the springs may be easily removed.
2. Place the two springs in position (one on each side of the hub), so a tanged end of each spring falls into the same keyway in the hub (inset, fig. 7B-11). Holding keys in position, align etched marks (fig. 7B-11), in hub and sleeve, then slide hub into sleeve. Be sure etched marks align after assembly.

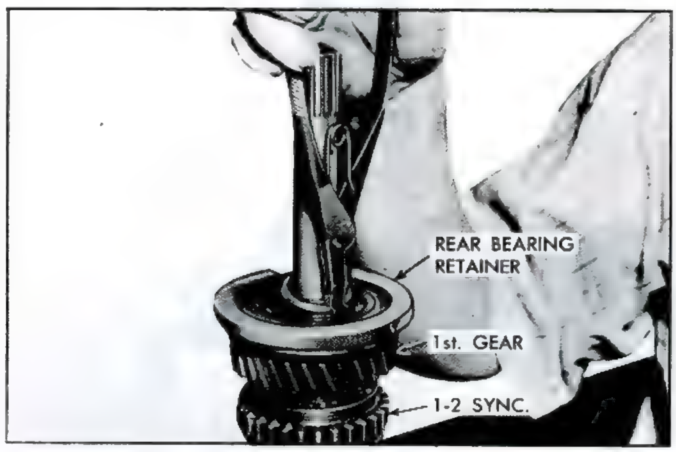


Fig. 7B-10—Rear Bearing Snap Ring

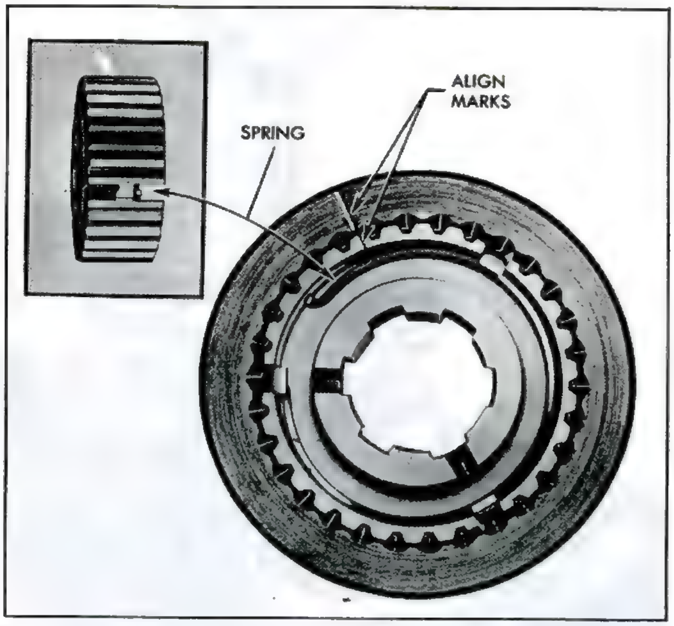


Fig. 7B-11—Synchronizer Spring and Hub Installation

Rear Bearing Race Replacement

If inspection reveals the necessity to replace the rear bearing, place the bearing and retainer in a press (fig. 7B-12). Expand retainer ring and press out bearing. Install a new bearing by reversing this procedure.

Assembly of Mainshaft

1. Install second speed gear with clutching teeth toward 1-2 synchronizer (rear), then place the 2nd speed blocker ring on second speed gear.
2. Install 1-2 synchronizer hub onto mainshaft with shift fork groove of hub toward second gear. Install 1-2 synchronizer assembly, being sure to engage blocker ring notches with keys in synchronizer unit. Place first gear sleeve on mainshaft. Press first gear sleeve, synchronizer hub, and second speed gear onto mainshaft until they bottom, using J-5590 or other suitable tool.

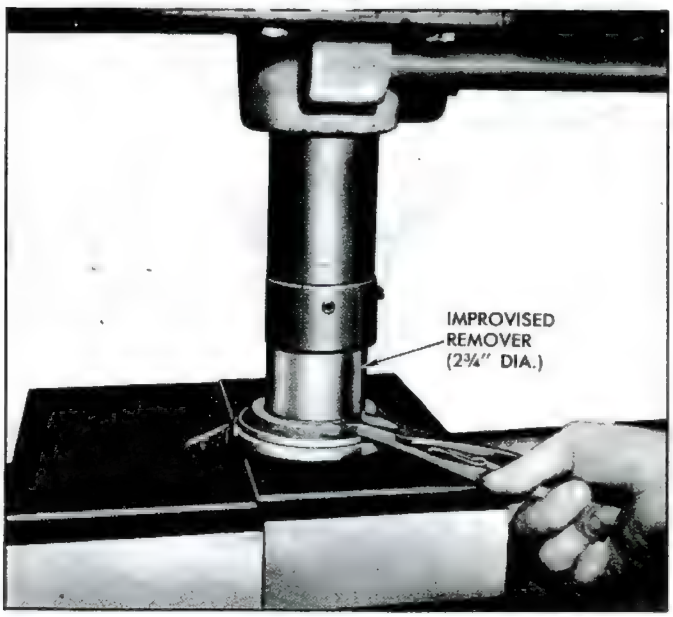


Fig. 7B-12—Pressing Rear Bearing from Bearing Retainer

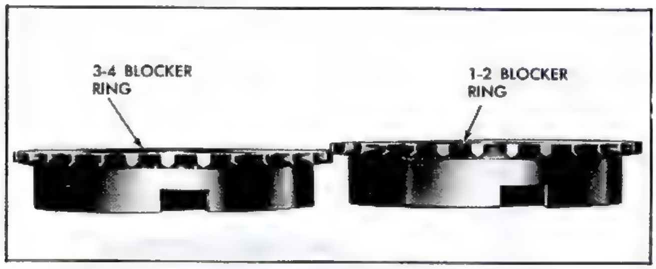


Fig. 7B-13—Blocker Ring Length Comparison

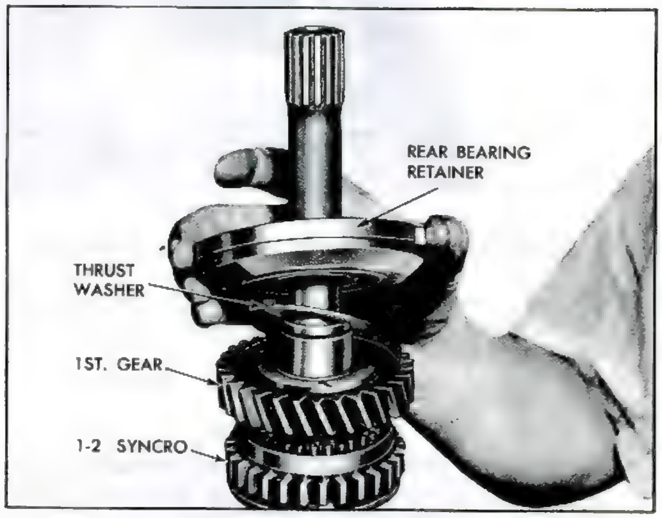


Fig. 7B-14—Installing 1-2 Synchronizer, First Gear, and Rear Bearing Retainer on Mainshaft

3. Install blocker ring in rear of 1-2 synchronizer, being sure that notches in blocker ring engage keys in synchronizer unit. It should be noted that blocker rings used in the 1-2 synchronizer have slightly longer hubs than those used in the 3-4 synchronizer (fig. 7B-13). Then slide first speed gear and its thrust washer onto mainshaft (fig. 7B-14).
4. Install assembled rear bearing retainer and rear bearing onto mainshaft and secure with selective fit snap ring. With the proper snap ring installed (three thicknesses available), maximum end play between rear face of rear bearing and snap ring will be .005".
5. Invert mainshaft and install third speed gear, clutching teeth upward, onto mainshaft and seat it against the mainshaft shoulder.
6. Place 3rd speed blocker ring on cone surface of third speed gear, then slide 3-4 synchronizer unit onto blocker ring. Be sure notches in blocker ring engage clutch keys in synchronizer unit. Install 4th speed blocker ring onto 3-4 synchronizer unit.
7. Install special snap ring to front of mainshaft.
8. If mainshaft roller bearings have become displaced, load 34 needle bearings into innermost diameter and 38 needle bearings into outermost diameter, using a generous amount of petroleum jelly to prevent roller

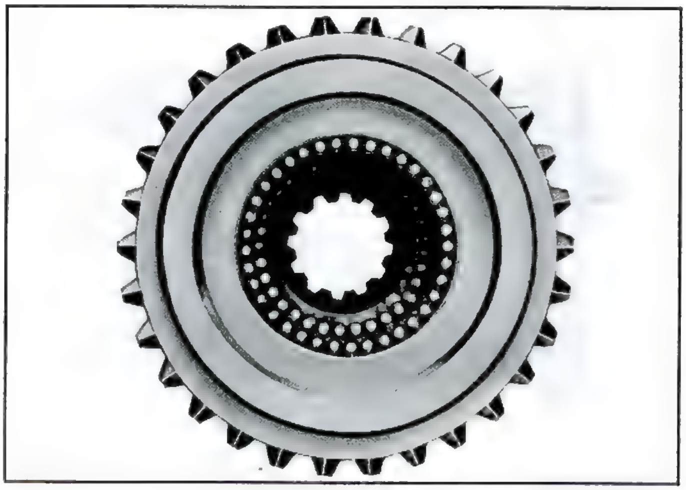


Fig. 7B-15—Mainshaft Roller Bearings Installed in Clutch Gear

bearings from becoming displaced from clutch gear (fig. 7B-15).

9. Carefully slide clutch gear onto mainshaft. It is good practice to place the clutch gear on a bench with its pilot bore upward and insert the mainshaft into the clutch gear. This prevents accidentally dislodging the clutch gear roller bearings. This completes assembly of the mainshaft (fig. 7B-16).

Assembly of Transmission

1. If removed position reverse inhibitor springs and ball in transmission case and secure with two plugs.
2. Coat selector shaft with grease, then insert through seal from the inside of the case. Do not install shaft from front of case as notches in selector shaft will damage seal lips.
3. Attach shift finger to selector shaft using two bolts and lock washer assemblies.
4. Using a generous amount of petroleum jelly, position the countergear thrust washers in the case. Be sure the thrust washer tabs engage the grooves in the case.
5. Insert the countergear with its roller bearings and dummy shaft (9/16" x 7") into the case via the rear bearing hole. Carefully lift the countergear into alignment with the countershaft holes in the case, then tap the countershaft into the gear from the rear of the case (fig. 7B-17). Use care to keep the dummy shaft constantly against the countershaft during the installation to prevent losing countergear roller bearings. Tap countershaft in until it is flush with the front face of the case. The countershaft is a slight press fit at the front of the case.

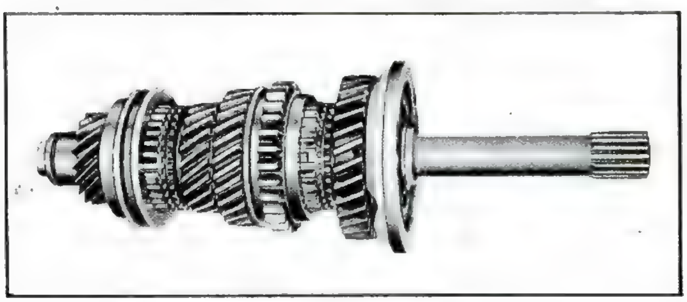


Fig. 7B-16—Assembled Mainshaft

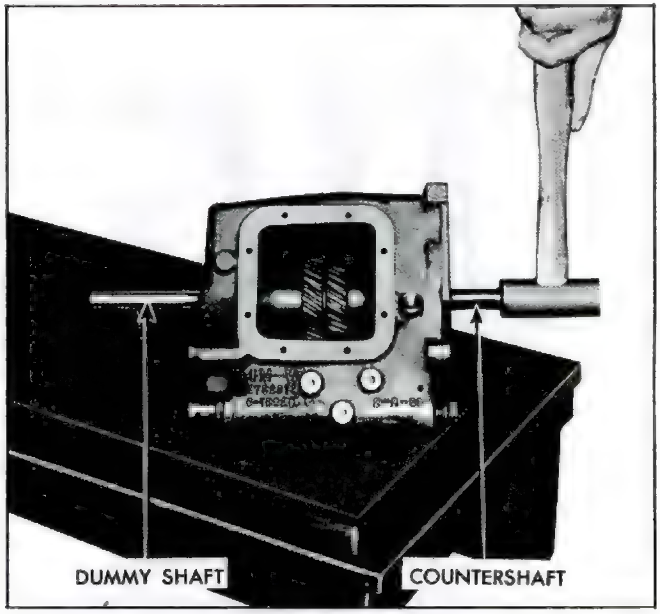


Fig. 7B-17—Installing Countergear Shaft

6. Place reverse shifter lever (fig. 7B-18) on pin in case with tapered end away from the reverse inhibitor.
7. Place the reverse idler gear shift fork in the case with its pin toward the front (fig. 7B-18). Engage the fork pin with the reverse shifter lever, then insert the shift fork shaft.

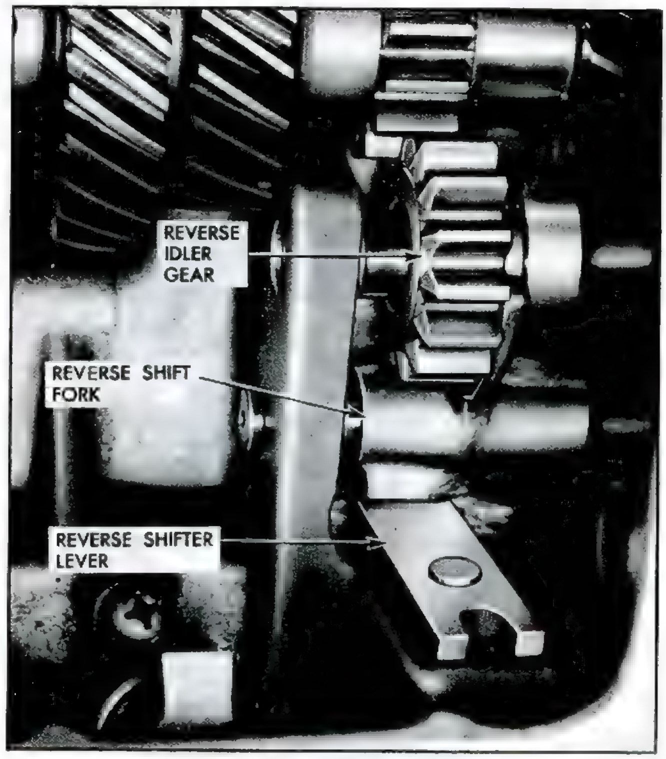


Fig. 7B-18—Installation of Reverse Shifter Lever, Shift Fork, and Reverse Idler Gear

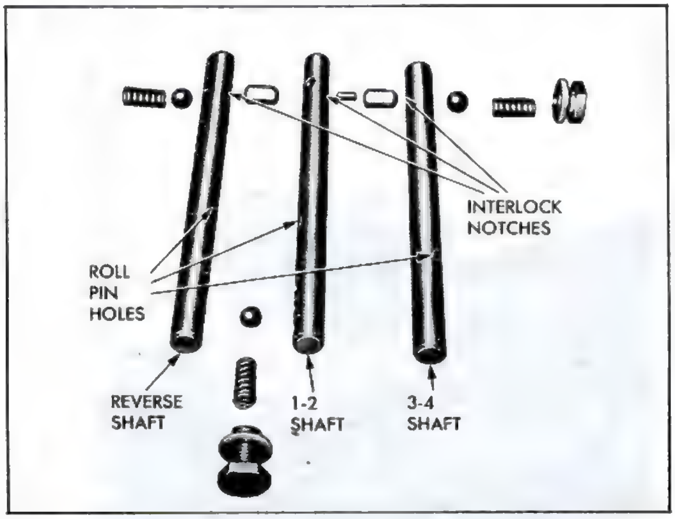


Fig. 7B-19—Shift Fork Shaft Identification

8. With the reverse idler gear shift fork fully rearward, engage the reverse idler gear to the shift fork (fig. 7B-18). Then align the Woodruff key groove in the idler gear shaft with the keyway in the rear face of the case and slide the shaft almost fully into the case, install Woodruff key in shaft, then fully bottom shaft.
9. Tap both reverse idler and shift fork shafts to insure full seating, then stake each shaft bore in two places below the rear face of the case adjacent to the shaft chamfer. Be sure stakes do not protrude above the rear face as this would disrupt the mating surface for the axle.
10. Insert a detent spring and ball in the 3-4 detent channel, checking that the spring goes fully to the bottom of the channel and that the detent ball does not roll out the reverse shifter head shaft hole in the detent channel.
11. Lay out the shift fork shafts as illustrated in Figure 7B-19 to prevent mixing the shafts during installation. With the interlock notches aligned, the reverse shifter head shaft can be identified as its pin hole is approximately centered on the shaft. The 1-2 fork shaft is most easily recognized as it has two interlock notches in the shaft and these notches are connected by a drilled hole which houses the interlock pin. Finally, the 3-4 fork shaft roll pin hole is closest to the end of the shaft opposite the detent notched end.

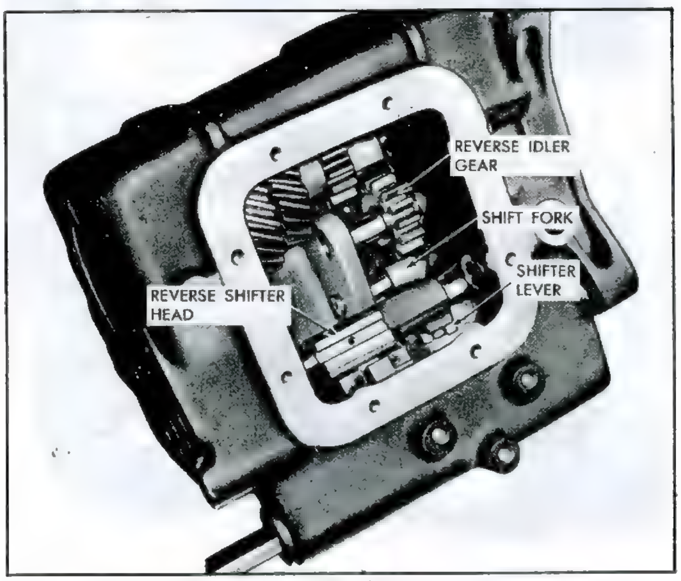


Fig. 7B-20—Reverse Shifter Head Installation

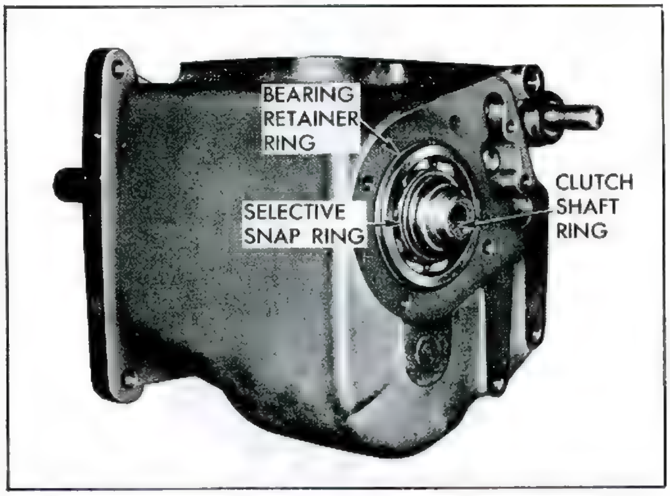


Fig. 7B-21—Clutch Gear and Bearing Snap Rings

12. Depress the detent ball and spring in the 3-4 detent channel slightly with a small drift and insert the reverse shifter head shaft (fig. 7B-20) partially into the case to compress the detent. Then engage the pin of the reverse shifter head with the yoke of the reverse shift lever. Check that the shaft pin hole is aligned with the pin hole in the shifter head and push the shaft through until the pin holes in the head and shaft align. Secure shifter head to shaft with roll pin.
13. To install the assembled mainshaft in the case, shift the synchronizers into second and fourth simultaneously (both full forward) to provide clearance to pass the countergear. Insert the mainshaft through the rear bearing bore into the case. Align rear bearing retainer portion of clearance hole with portion of clearance hole located at the 2 o'clock position on the rear face of the case, then tap rear bearing retainer into case until flush with the rear face. Install two bearing retainer snap rings.
14. With large snap ring installed in outer diameter of front bearing, tap bearing into front of case and over clutch gear hub until large snap ring seats against front of case.
15. Retain clutch gear in bearing with selective snap ring (fig. 7B-21). With proper snap ring installed, maximum end play between bearing and snap ring will be .005".
16. Install small snap ring in inner diameter of clutch gear (fig. 7B-21). This snap ring acts as a bottoming stop for the input clutch shaft.
17. Prior to installing the 1-2 shift fork, shift the 1-2 synchronizer and the 3-4 synchronizer to neutral. Then install one interlock in the 3-4 detent channel.
18. With the interlock pin in the hole in the interlock notch end, push the 1-2 shift fork shaft partially

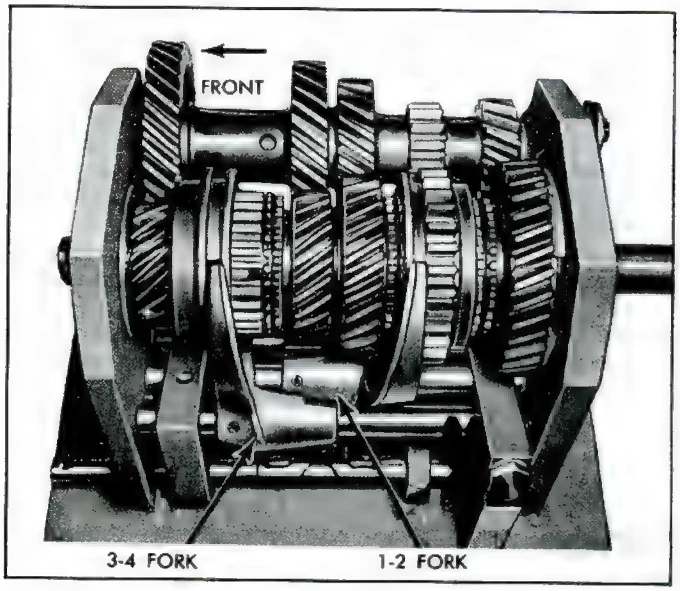


Fig. 7B-22—Shift Forks Installation

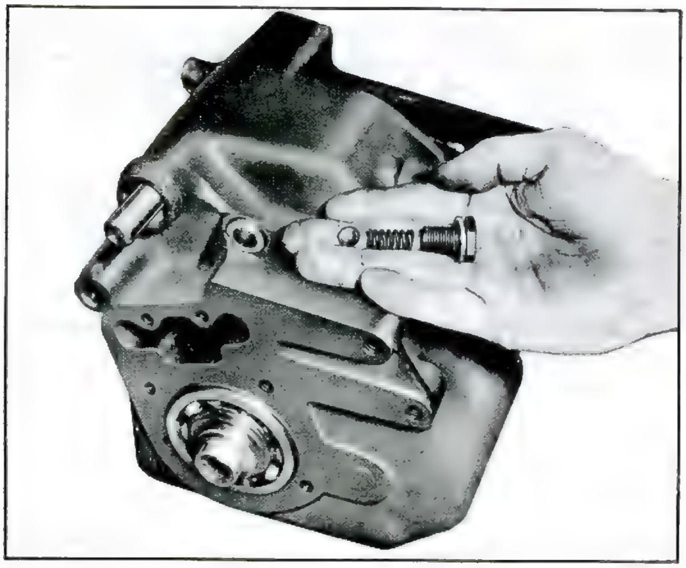


Fig. 7B-23—Installing 1-2 Shift Fork Detent Components

into the case. The interlock end (two opposite notches) of the shaft goes to the rear of the case. Engage 1-2 shift fork (fig. 7B-22) which is identified by the thru gate at the shift location, with the 1-2 synchronizer. Align the pin holes in the shaft and fork, then tap shaft rearward until it engages interlock and secure fork to shaft with roll pin.

19. Install detent ball, spring, gasket, and cap in 1-2 detent channel (fig. 7B-23). Cap used at this location has the longer shank.
20. Drop pin and remaining interlock into 3-4 detent channel, then push 3-4 shift fork shaft partially through hole in front of case. Engage 3-4 shift fork (fig. 7B-22) in 3-4 synchronizer, align pin hole in shift fork and shaft, then push shaft fully to rear of case until it engages interlock. Secure shift fork shaft with roll pin.
21. Install remaining detent ball, spring, nylon washer, and cap in 3-4 detent channel at left-rear of case.
22. Prior to installing front bearing retainer and side cover, test operation of shift forks by actuating the shift selector lever with a small pin punch inserted in the hole in the shifter shaft. If transmission shifts satisfactorily, install front bearing retainer using a new gasket and secure with seven bolts tightened 15-20 ft. lbs. Complete assembly of transmission by installing side cover with new gasket and secure with eight bolts tightened 3-4 ft. lbs.

MANUAL TRANSMISSION REMOVAL AND INSTALLATION

1. Disconnect engine seal at front shield, left and right sides.

   NOTE: Disconnect seal from shield by grasping at lower edge and pulling groove of seal off of shield flanges.

2. Disconnect starter motor wires at quick disconnect connector and one battery cable at battery.
3. If so equipped, disconnect radio ground straps at left and right shields.
4. Raise vehicle and support on jack stands: then remove grille and rear center shield.
5. Place engine lift with Tool J-7894 attached, under engine and support weight of engine.
6. Loosen two engine rear mount nuts until nuts are flush with end of stud.
7. Disconnect fuel line from body clip so that line can spring away from floor pan.
8. Remove two upper retaining bolts from left and right rear strut rod brackets at differential carrier, then loosen two lower retaining bolts at left and right rear strut rod bracket approximately 3 turns.
9. Disconnect accelerator rods at transmission bellcrank.
10. Disconnect left and right front strut rod brackets at engine front mount bracket.
11. Drain transmission and axle.
12. Disconnect clutch control rod at cross shaft.
13. Disconnect and remove clutch cross shaft.
14. Disconnect shift rod coupling at transmission shift rod.
15. Disconnect emergency brake return spring at front mount bracket.

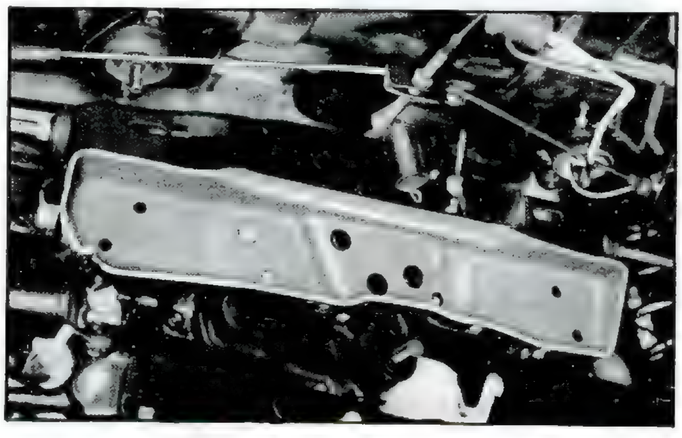


Fig. 7B-24—Removing Manual Transmission from Vehicle

16. If so equipped, disconnect back up lamp switch.
17. Lower front of engine enough for transmission to clear underbody on removal. Remove bolts retaining transmission to differential then remove transmission from differential.

NOTE: Transmission input shaft remains engaged in clutch and will protrude out through differential. Transmission is removed with front mount bracket attached.

18. For installation of transmission reverse removal procedures.
19. Check and adjust clutch if necessary as outlined under "Clutch Linkage Adjustment" in this section.
20. Refill axle and transmission with lubricant specified in Section 0,
21. Install engine seal to shields by lubricating groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange with one hand, press seal in place with a block of wood or hammer handle.
22. Check operation of shift linkage and adjust if necessary as outlined under "Shift Linkage Adjustment" in this Section.
23. Check operation of parking brake and accelerator controls, adjusting if necessary as outlined in Sections 5 and 6 respectively.

SPECIAL TOOLS

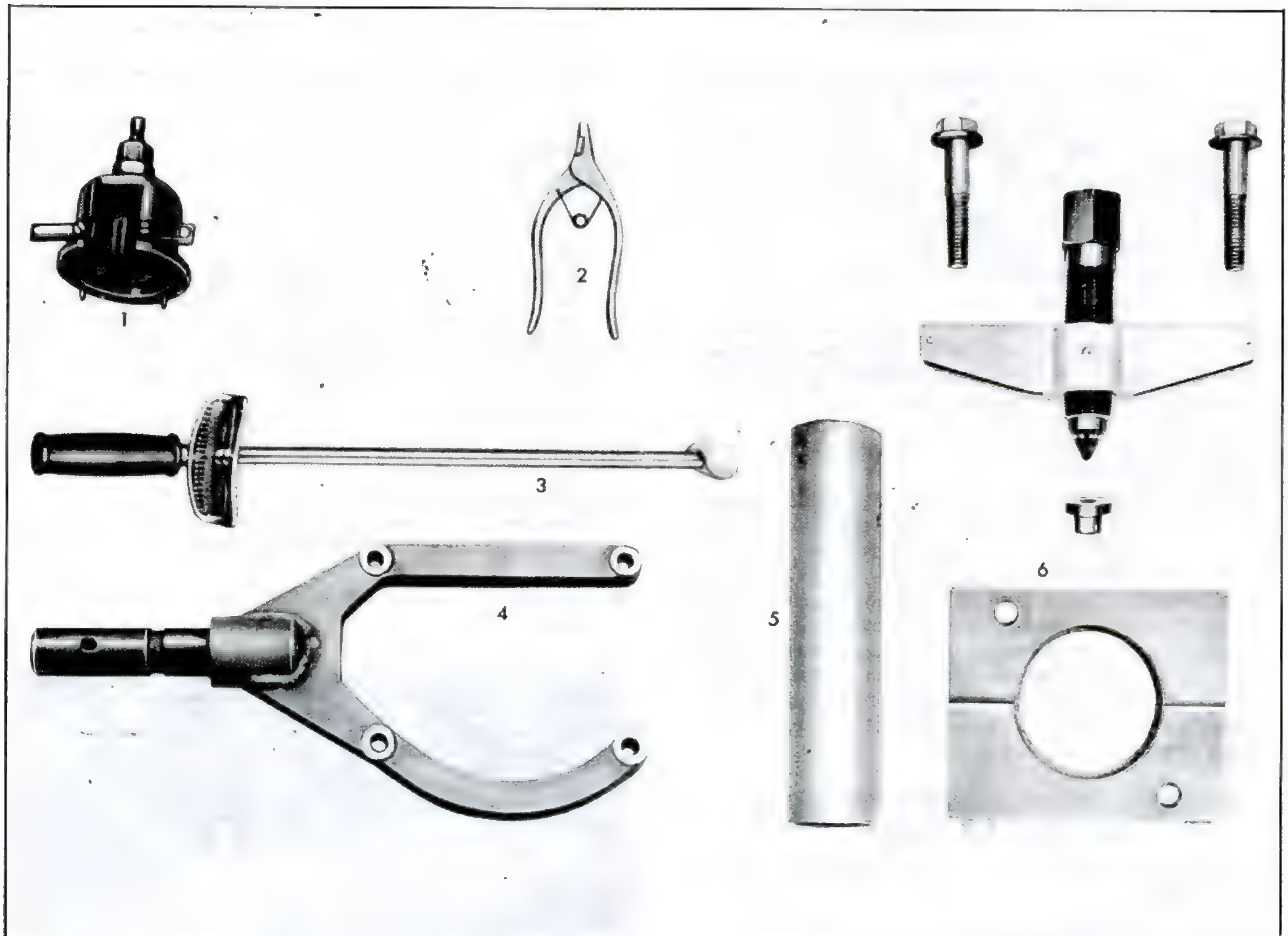


Fig. 7B-25—Manual Transmission Special Tools

1. J-8361 Clutch Gear Puller
2. J-932 Synchronizer Retainer Pliers
3. J-1264 Torque Wrench
4. J-7896 Holding Fixture
5. J-5590 Installer
6. J-8880 Clutch Gear Bearing Puller

SECTION 7
AUTOMATIC TRANSMISSIONS

INDEX

GENERAL DESCRIPTION

The "Corvair" Powerglide (fig. 7E-1) consists of an air cooled, three element torque converter which drives through an automatic shift, two-speed planetary transmission.

As illustrated, the Powerglide transmission is integrated to the differential carrier to form a Transaxle. As a result, the converter is remote from the main transmission assembly, being separated by the differential carrier. Two shafts run axially through the hollow pinion shaft; one from the converter cover hub to the front pump and the other from the turbine to the input sun gear to transmit converter torque to the transmission gear box.

Excepting the converter location, mechanical components of the "Corvair" Powerglide are generally scaled-down versions of comparable parts in conventional Powerglides. The use of a plate-type reverse clutch and a welded converter with integral starter driven gear are obvious exceptions. Gear ratios are 1.82:1 in low and reverse and 1:1 in high gear. Automatic low is also 1.82:1.

Selector lever positions from top to bottom are Reverse, Neutral, Drive and Low. No Park position is provided. Power flow sequences in each range are identical to conventional Powerglide transmissions.

The manual low inhibiting feature is designed to protect the transmission from damage which could result from moving the selector lever into Low while the vehicle is traveling more than approximately 55 MPH. For example, if the driver moved the selector lever into "low" at 70 MPH, the transmission would remain in "high" until vehicle speed was reduced to approximately 55 MPH, and then the downshift would occur.

Part throttle downshifts are provided to provide better low speed acceleration characteristics. At speeds below 25 MPH, a downshift to Low will occur if the accelerator is moved to one-half throttle or more. The subsequent upshift will occur at 34-41 MPH. As with the conventional Powerglide, wide-open throttle downshifts are possible with the speed limitations being 38-44 MPH.

MAINTENANCE AND ADJUSTMENTS

OIL REQUIREMENTS

The Powerglide transmission requires a special oil as specified in Section 0 of this manual. This oil is available through Chevrolet dealers and oil company filling stations in sealed containers.

Oil Level

The transmission oil level should be checked periodically. Oil should be added only when the level is near the "ADD" mark on the dip stick with oil at normal operating temperature. The oil level dip stick is located in the right-front of the engine compartment.

NOTE: The difference in oil level between Full and Add is one (1) pint.

In order to check oil level accurately, the engine should be idled with the transmission oil at normal temperature and the control lever in neutral (N) position.

It is important that the oil level be maintained no higher than the "FULL" mark on the transmission oil level gauge. DO NOT OVERFILL, for when the oil level is at the full mark on the dip stick, it is just slightly below the planetary gear unit. If oil is added which brings the oil level above the full mark, the planetary unit will run in the oil, foaming and aerating the oil. This may cause malfunction of the transmission assembly due to improper application of the band or clutches.

If the transmission is found consistently low on oil, a thorough inspection should be made to find and correct all external oil leaks. Transmission oil leakage is easily

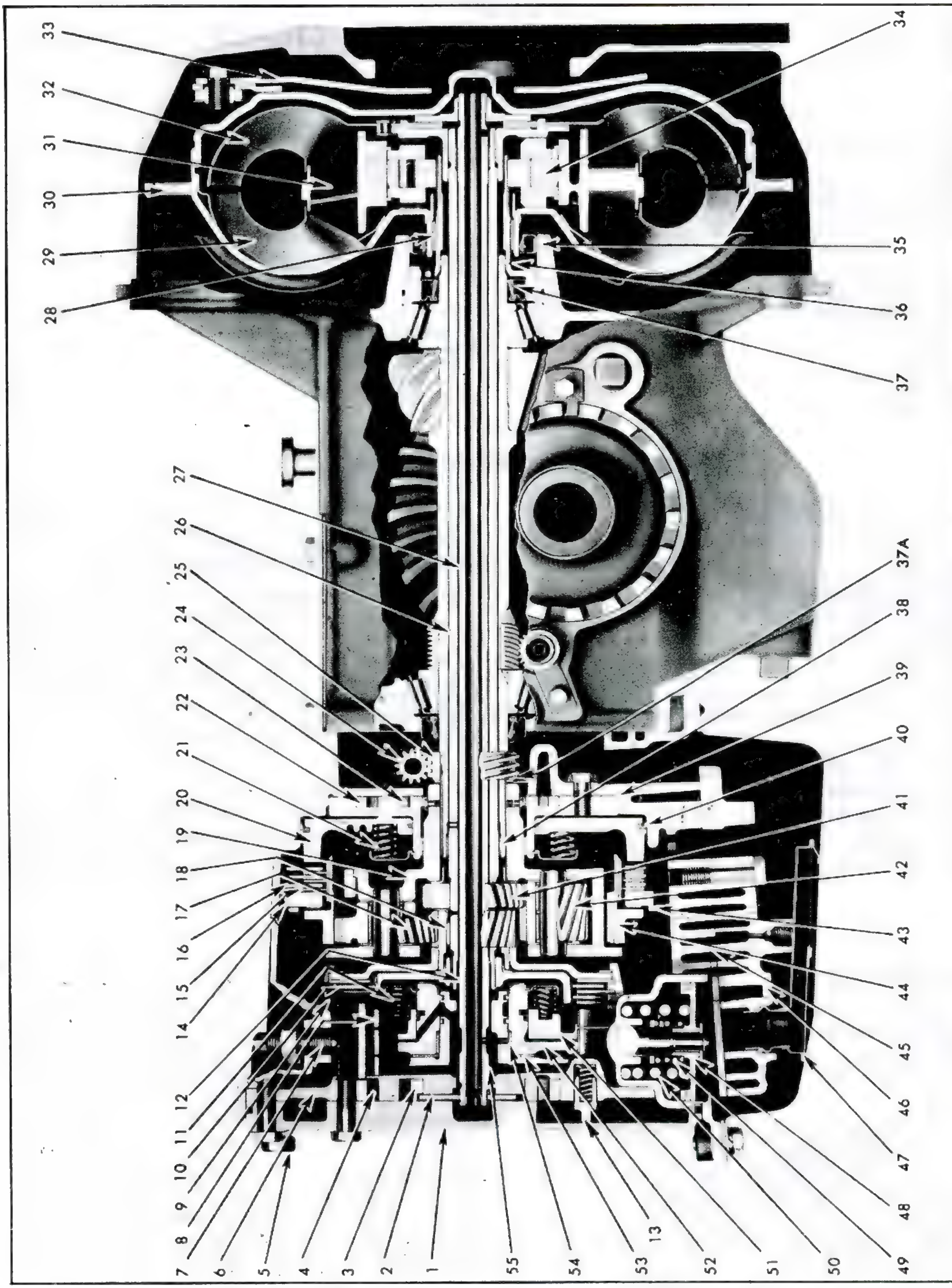


Fig. 7E-1—"Corvair" Powerglide—Cross Sectional View (L.D.F.C. Shown)

identified as all automatic transmission fluid used in Chevrolet production is dyed red.

All mating surfaces such as the front pump, oil pan rail, filler tube, governor, and the attachment to the differential carrier should be carefully examined for signs of leakage. The vacuum modulator must also be checked to insure that the diaphragm has not ruptured as this would allow transmission oil to be drawn into the intake manifold. Usually, the exhaust will be excessively smoky if the diaphragm ruptures due to the transmission oil added to the combustion.

Draining and Refilling

No periodic draining of the transmission oil is recommended.

When the transmission requires repair, drain the oil by loosening the filler tube attaching nut in the oil pan and allow oil to drain; no drain plug is provided.

To refill the transmission, tighten the filler tube attaching nut and add four (4) pints transmission fluid using J-4264 filler tube and funnel. Start engine and allow engine to idle in Neutral 3-5 minutes to warm oil, then check oil and add as required to raise to the level of the "FULL" mark. Assuming that the converter was not drained (since it is welded) and allowing for a nominal spillage or draindown, approximately six (6) pints of oil will be required for refill.

CAUTION: Do not over-fill!

The dry capacity of the transmission, including converter, is 12 pints. Normal refills require 6 pints.

SHIFT LINKAGE CHECK AND ADJUSTMENT

Check

If improper shift linkage adjustment is suspected, a check can be made quickly without any disassembly as described below:

1. Start engine. If job is cold, allow 2-3 minutes for the transmission fluid to warm-up.
2. With engine at normal idle speed, then very slowly move the range selector lever up from "N" toward "R" and note by feel the point at which the reverse clutch applies. Properly adjusted, the reverse clutch should apply within the band from the tooth peak to full Reverse detent (fig. 6E-2).
3. Make the same check as in Step 2 above while moving the selector lever from "N" toward "D". Properly adjusted, the low band should apply as the selector lever follower is felt to be between the tooth peak separating Neutral from Drive and full Drive detent.
4. Unless the shifts are obtained at the points illustrated in Figure 7E-2, the shift linkage should be adjusted with Gauge J-8365.

Adjustment

Adjustment of the manual valve linkage should be checked after any transmission overhaul or control cable, or range selector control assembly replacement, as described below:

1. If necessary, drain oil from transmission by unscrewing filler tube nut, then remove oil pan.
2. Place the range selector lever in the driving compartment in "D" (Drive).
3. Insert J-8365 into manual valve bore as shown (fig. 7E-3) with tab of gauge upward so it engages to forward port of the valve body as shown in the inset, Figure 7E-3.
4. With J-8365 in place, push forward on the manual valve levers as shown. Properly adjusted, J-8365 will be held in place horizontally without being supported.
5. If readjustment is required, loosen lock screw (fig. 7E-3), push the manual valve levers forward so that J-8365 is held in this attitude. Recheck adjustment as described in Step 4.
6. When satisfactory adjustment is obtained, install oil pan and filler tube, then refill transmission with oil as described earlier in this section.

NEUTRAL SAFETY SWITCH ADJUSTMENT

Properly adjusted, the neutral safety switch (fig. 7E-4) should prevent engine cranking when the ignition switch is turned to "Start" with the transmission selector lever in any position other than "N" (Neutral). If engine cranks with selector lever in a position other than "N", adjust the switch position by loosening the two switch mounting screws, placing the range selector in Neutral, and turning the ignition switch to "START". Shift the switch fore and aft until engine cranking begins, then secure switch in that position.

Fig. 7E-1—"Corvair" Powerglide—Cross Sectional View

1. Front Pump Cover
2. Front Pump Shaft Drive Hub
3. Front Pump Drive Gear
4. Front Pump Driven Gear
5. Transmission Vent
6. Front Pump Body
7. Low Band Adjusting Screw and Locknut
8. Low Band
9. Clutch Drum Reaction Plate (3 Used)
10. Clutch Drum Faced Plate (2 Used)
11. Clutch Piston Return Spring (15 Used)
12. Turbine Shaft Front Bushing
13. Front Pump Priming Valve
14. Reverse Clutch Front Reaction Plate (Thick)
15. Reverse Clutch Faced Plates (3 Used)
16. Reverse Clutch Reaction Plate (3 Used)
17. Short Pinion
18. Low Sun Gear Bushing
19. Planet Carrier Hub (Transmission Output)
20. Reverse Piston
21. Reverse Piston Return Spring (17 Used)
22. Rear Pump Driven Gear
23. Rear Pump Drive Gear
24. Governor Driven Gear
25. Governor Drive Gear
26. Turbine Shaft
27. Front Pump Shaft
28. Converter Hub Bushing
29. Converter Pump
30. Starter Gear
31. Stator
32. Turbine
33. Engine Flex Plate
34. Stator Cam Race
35. Converter Hub Seal
36. Stator Shaft
37. Pinion Shaft Rear Oil Seal
37A Rear Selective Thrust Washer
38. Pinion Shaft Bushing
39. Rear Pump Wear Plate
40. Reverse Piston Outer Seal
41. Planet Carrier Input Sun Gear
42. Long Pinion Gear
43. Reverse Clutch Plate Retaining Ring
44. Ring Gear
45. Valve Body Transfer Plate
46. Valve Body
47. Oil Pick-up Pipe
48. Low Servo Piston
49. Low Servo Piston Cushion Spring
50. Low Servo Piston Return Spring
51. Clutch Drum Piston
52. Clutch Drum Hub
53. Clutch Drum Selective Thrust Washer
54. Clutch Drum Bushing
55. Front Pump Body Bushing

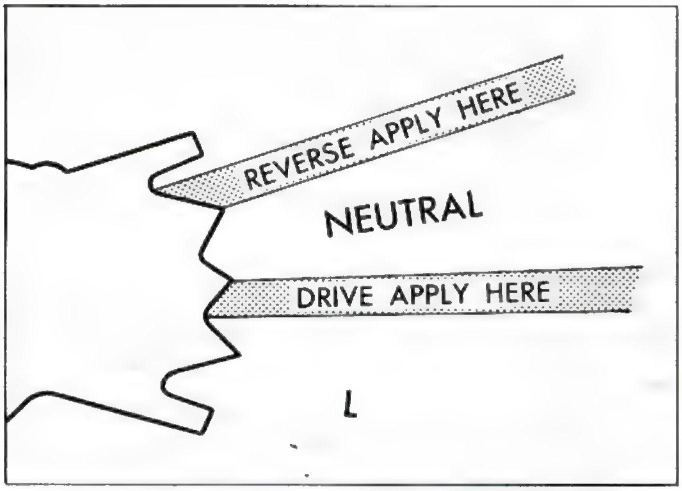


Fig. 7E-2—Shift Linkage Check Diagram

THROTTLE VALVE LINKAGE ADJUSTMENT

Correct throttle valve (TV) linkage adjustment is necessary to provide the correct shift schedule.

As special linkage is not used to actuate the transmission TV, refer to Section 6M of this Manual for the adjustment procedures.

LOW BAND ADJUSTMENT

No periodic adjustment of the low band is recommended.

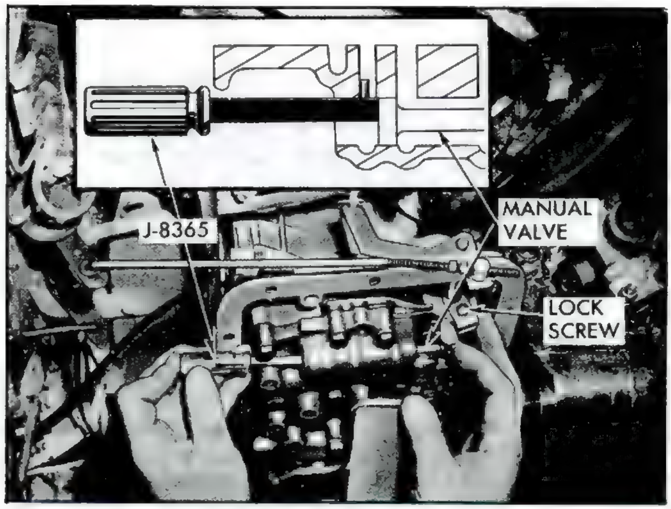


Fig. 7E-3—Adjusting Manual Valve Linkage with J-8365

To gain access to the low band adjusting screw, the front end of the Transaxle assembly will have to be lowered.

Adjustment of the low band requires an extra deep 3/4" socket and a short handled, inch pound torque wrench such as J-5853.

To adjust, loosen the locknut and tighten the adjusting screw to 40 ±5 in. lbs. torque, then back-off four (4) full turns exactly. While holding the adjusting screw stationary by means of a socket and extension inserted through the 3/4" deep socket, tighten the adjusting screw locknut securely.

SERVICE OPERATIONS

SERVICE OPERATIONS—TRANSMISSION IN VEHICLE

RANGE SELECTOR ASSEMBLY

Removal

1. Remove the "E" retainer (fig. 7E-4) and disconnect the control cable from the range selector assembly.
2. Remove the nut securing the control cable to its attaching bracket on the range selector and free the cable from the range selector.
3. Remove the instrument cluster as described in Section 12 of this manual.
4. Disconnect electrical leads to the neutral safety switch and remove control lever knobs and knob stud, then complete removal by removing two screws attaching range selector assembly to instrument cluster and removing the quadrant light from its clip on the selector.
5. If range selector is to be replaced, remove the neutral safety switch.

Repairs

The range selector assembly is serviced only as an assembly.

Installation

1. If a new range selector assembly is being installed, loosely attach the neutral safety switch. Specific instructions for this installation are in Section 12.
2. Secure the range selector assembly to the instrument cluster with two screws and insert the quadrant light in its bracket.
3. Install the instrument cluster in the instrument panel as described in Section 12.

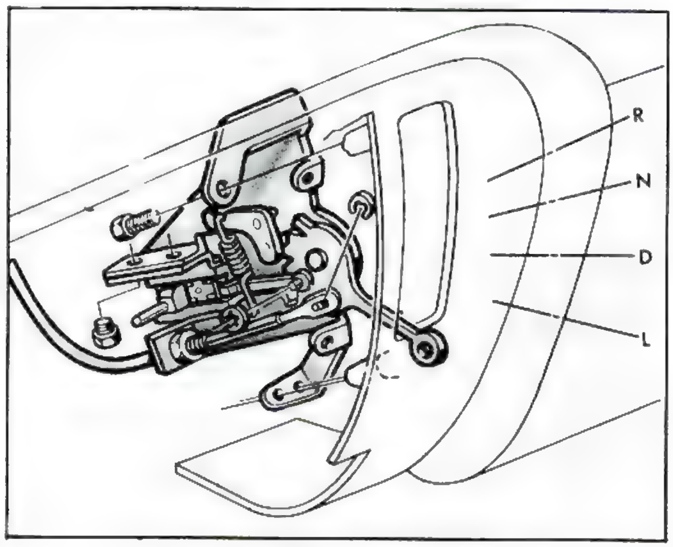


Fig. 7E-4—Neutral Safety Switch

4. Insert the shift cable into its mounting bracket on the range selector. The attachment of the cable to the bracket is critical, so be sure that the flat on the cable sheath is flush when the cable is installed (fig. 7E-4). Holding the sheath nut with a wrench, install the sheet metal nut on the threaded portion of the sheath to secure the cable to the range selector bracket.
5. Insert the cable eye onto the actuating post on the range selector lever and secure with the "E" retainer.
6. After a range selector removal or replacement, check the shift linkage and neutral safety switch adjustments as described in "Adjustments" earlier in this section.

CONTROL CABLE ASSEMBLY

Removal

1. Disconnect the control cable from the range selector as described in Steps 1 and 2 of "Range Selector Assembly."
2. Remove tunnel covers.
3. At front of vehicle, remove cable from the dash clip (fig. 7E-5) and from beneath parking brake pulley shaft.
4. Remove cable from the three body harness clips in the tunnel.
5. Remove the grommet plate at the rear of the tunnel, free the cable sheath from the plate, and remove the clip in the underbody kick-up area.
6. Disconnect the throttle rods from the TV lever on the transmission.
7. Complete cable removal by rotating the transmission TV lever its full limit counter-clockwise to free the cable ball from the inner manual valve lever slot in transmission and withdraw the cable. Bow cable towards center line of vehicle to guide cable through hole in engine front support.

Repairs

The transmission manual valve cable assembly with its two captive grommets are serviced only as an assembly.

Installation

1. With the tunnel covers removed, lay the cable out beneath the car in its correct relationship.
2. Insert front of cable up into passenger compartment. Cable must then be routed under the parking brake cable and then over the brake pipe to prevent the possibility of the brake cable riding against the shift cable and establishing a sawing action.
3. After the cable routing is satisfactory, connect the shift cable to the range selector as described under "Range Selector Assembly," Installation Steps 4 and 5.
4. Shift range selector to "D" (drive), then route cable through the upper dash clip and close clip; continue routing the cable through the underbody opening and under the parking brake pulley shaft at the base of the toe-pan. Be sure rubber protector is installed on the cable sheath (fig. 7E-5).
5. Secure the cable with the two clips provided in the tunnel area. Bow cable towards center line of vehicle to guide cable through hole in engine front support.

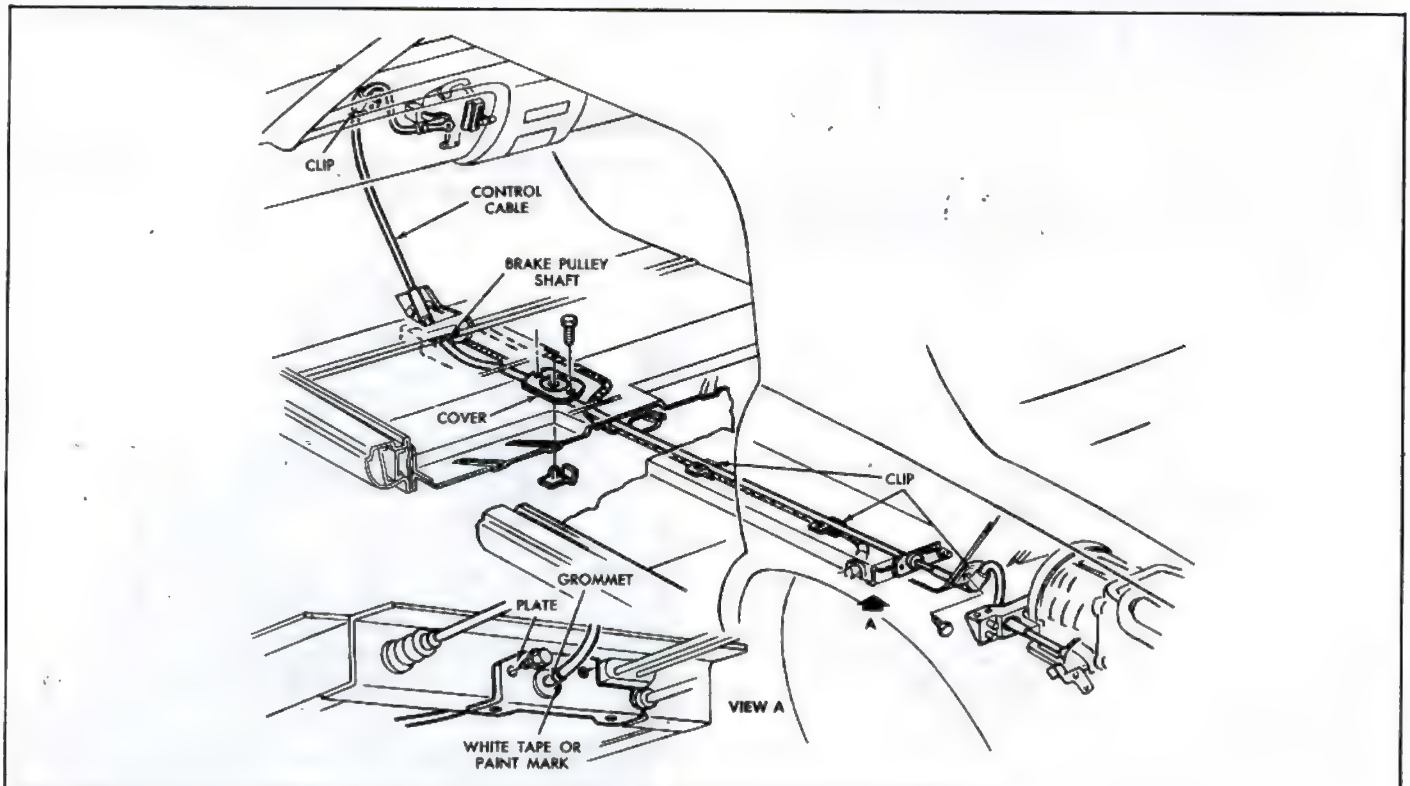


Fig. 7E-5—Shift Control Cable Routing

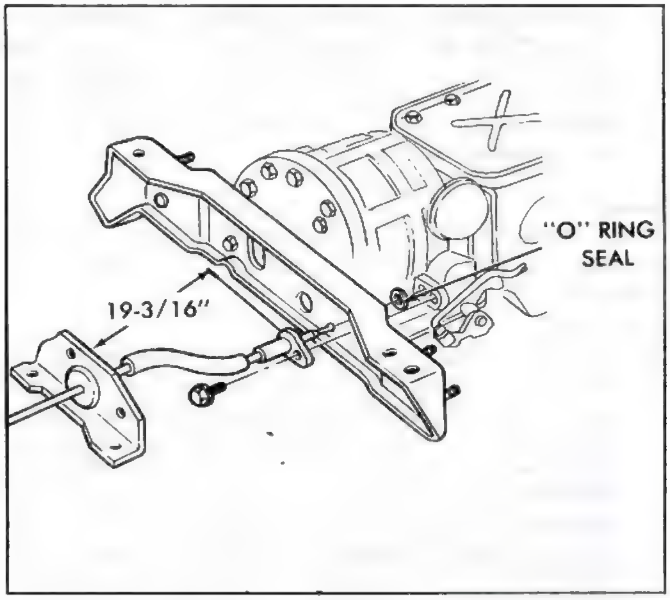


Fig. 7E-6—Cable-to-Case Installation

6. Install "O" ring seal (fig. 7E-6) on cable, lubricate "O" ring lightly with Lubriplate.
7. With throttle rods disconnected from the throttle valve (TV) lever on the transmission, rotate the TV lever its full limit counter-clockwise and insert cable ball into the slot of the manual valve lever.
8. Fully seat "O" ring and secure installation by installing cap screw and lock washer.
9. Correctness of installation is easily checked. Once fully tightened, exert a slight hand pressure in the counter-clockwise direction and check that the hole in the notched arm of the TV lever is below the transmission oil pan rail (fig. 7E-7). If hole is above pan rail, cable installation is faulty and must be re-checked.
10. Install the cable rear grommet (fig. 7E-5) in the grommet plate, then install the grommet plate in the rear of the tunnel and pull cable thru grommet until white tape or paint mark is visible outside grommet.

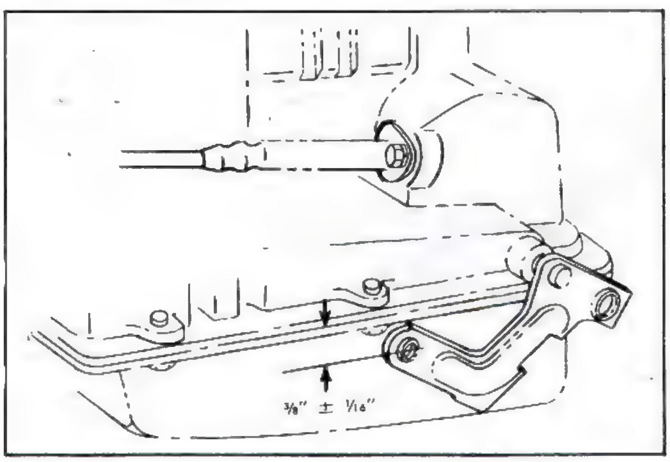


Fig. 7E-7—Cable Installation Check Diagram

11. Install clip on cable in rear kick-up area (fig. 7E-5).
12. Check shift linkage for proper operation as described under "Adjustments" in this section.

VACUUM MODULATOR

The vacuum modulator is mounted on the right side of the transmission and can be serviced from beneath the vehicle.

Removal

1. Remove the vacuum hose at the vacuum modulator which runs from the engine vacuum balance tube.
2. Unscrew the vacuum modulator from the transmission using channel lock pliers or a thin 1" wrench, if available.
3. Remove the vacuum modulator valve (fig. 7E-8) from the transmission case.

Inspection and Repairs

Check the vacuum modulator valve for nicks and burrs If such cannot be repaired with a slip stone, replace the valve.

The vacuum modulator can be checked with a vacuum source for leakage. However, leakage normally results in transmission oil pull-over and results in oil smokey exhaust and continually low transmission oil. No vacuum modulator repairs are possible; replace as an assembly.

Installation

1. Install vacuum modulator valve in bore of transmission.
2. Place a new gasket on vacuum modulator and hold gasket centered with petroleum jelly. It is important that gasket be held centered during installation to prevent a transmission external oil leak.
3. Install vacuum modulator, tighten firmly, and install vacuum hose from engine balance tube.

GOVERNOR

The governor is accessible from beneath the vehicle and is mounted on the left side.

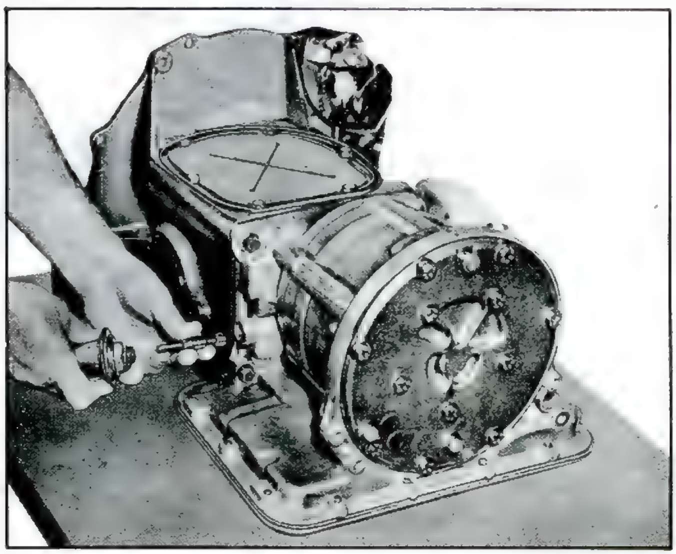


Fig. 7E-8—Removing Vacuum Modulator and Valve

Removal

Unscrew the lock screw securing the governor tab to the case, then pull the governor from the transmission.

Repairs

The only part replaceable on the governor is the driven gear. To remove drive out roll pin with a punch and pull out old gear. Drill a new hole in the governor 90 degrees from the original, then insert new gear and reinstall roll pin.

Installation

Install new "O" ring seal on governor, then insert governor into transmission with a slight twist to engage gear teeth. Secure installation with lock bolt.

VALVE BODY AND LOW SERVO

Removal

1. Loosen oil filler nut in order to drain transmission oil, then remove filler pipe from oil pan.
2. Disconnect throttle valve rods from TV lever on transmission.
3. Remove 14 bolts and lock washers securing oil pan and remove oil pan and gasket.
4. Remove valve body screw assembly (fig. 7E-9).
5. Make an improvised sheet metal strap (see fig. 7E-10), and loosely install with one pan bolt.
6. Remove bolts securing valve body to transmission, tap valve body lightly with a soft hammer to loosen from its dowels in the transmission case, then carefully lower the valve body about 1/16", then rotate improvised strap into place so it spans the servo piston hub and secure strap with pan bolt. This eliminates possibility of servo piston slipping down out of its bore and the loss of low band engagement with its apply components.
7. To remove the low servo piston, pull downward on the hub of the piston shaft with a screw driver.

CAUTION: Do not remove piston in vehicle unless low band screw is first tightened fully!

Disassembly—Valve Body

NOTE: All references are to Figure 7E-11.

1. If installed, remove manual valve (24).
2. Remove two clutch head screws (1) attaching hydraulic modulator valve body (16) and separate modulator body from main valve body (5).

CAUTION: Modulator body should be held during removal of screws as it is under spring pressure from the pressure regulator valve spring (19).

3. Remove pressure regulator valve spring retainer (18), spring (19), and pressure regulator valve (20).
4. From the hydraulic modulator body (16), remove the rear pump priming ball (15) and the front and rear pump check valves and springs (13 and 14). Also remove the hydraulic modulator valve (17). It will be noted that the rear pump check valve (14) embodies an air bleed pin.
5. Remove the two remaining clutch head screws (1), then separate the transfer plate (2) and gasket (3) from the main valve body (5).
6. To remove the low drive shift valve components, remove retainer ring (12) with Truarc pliers while exerting a downward force, then release the pressure and remove low drive regulator valve sleeve (11), regulator valve (10), spring seat (9), and inner and outer springs (7 and 8). Lightly tap main valve body with a plastic hammer to remove the low drive shift valve (6) from its bore.
7. To remove the TV valve components, remove retaining pin (4) by wedging a thin screw driver between its head and the surface of the main valve body, then remove detent valve assembly (21) and throttle valve spring (22). Complete disassembly of the valve body by removing the "E" ring (25) from the throttle valve, then remove throttle valve (23) from main valve body by tapping valve body with a plastic hammer.

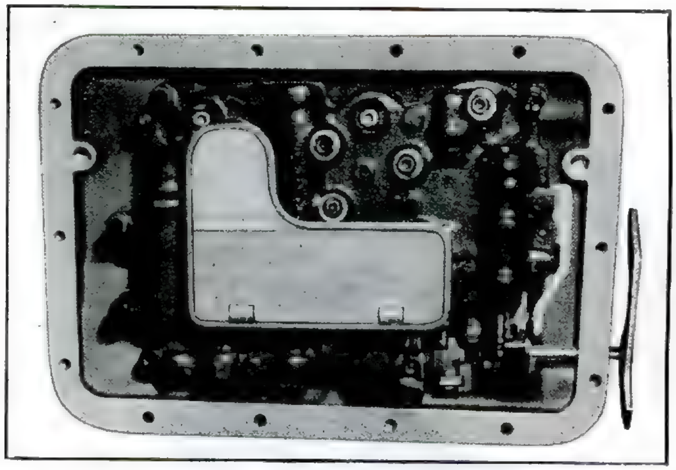


Fig. 7E-9—Valve Body Installed

Inspection—Valve Body

As most valve body failures are initially caused by dirt or other foreign material preventing a valve from functioning properly, a thorough cleaning of all parts in clean solvent is mandatory. Check all valves and their

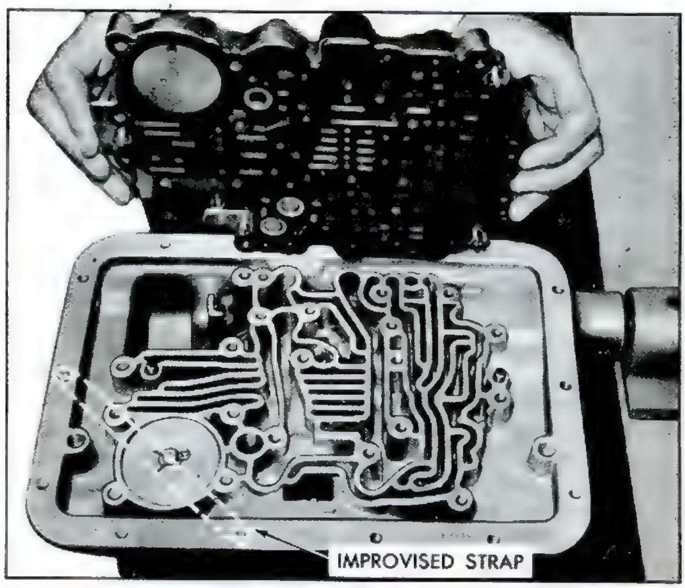


Fig. 7E-10—Removing Valve Body

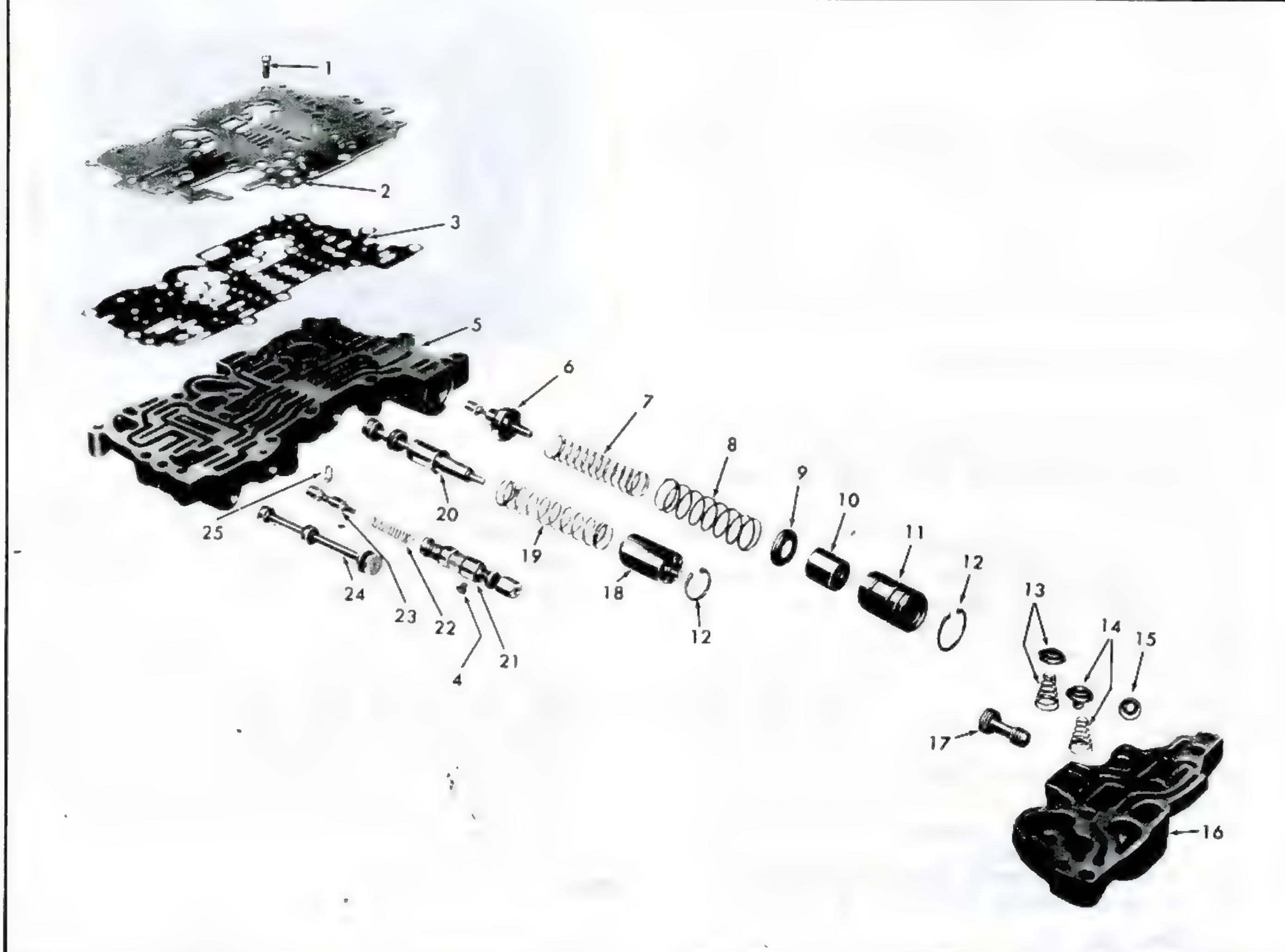


Fig. 7E-11—Corvair Powerglide Valve Body—Exploded View

1. Valve Body-to-Transfer Plate Attaching Screws (4)
2. Transfer Plate
3. Transfer Plate-to-Main Valve Body Gasket
4. Detent Valve Assembly Retaining Pin
5. Main Valve Body
6. Low-Drive Shift Valve
7. Low-Drive Valve Inner Spring
8. Low-Drive Valve Outer Spring
9. Spring Seat
10. Low-Drive Regulator Valve
11. Low-Drive Regulator Valve Sleeve
12. Retainer Ring
13. Front Pump Check Valve and Spring
14. Rear Pump Check Valve Spring
15. Rear Pump Priming Ball
16. Hydraulic Modulator Valve Body
17. Hydraulic Modulator Valve (Booster) Valve
18. Pressure Regulator Valve Spring Retainer
19. Pressure Regulator Valve Spring
20. Pressure Regulator Valve
21. Detent Valve Assembly
22. Throttle Valve Spring
23. Throttle Valve
24. Manual Valve
25. Throttle Valve Locating Ring

operating bores for burrs or other deformities which could result in valve "hang-up."

Assembly—Valve Body

1. Install hydraulic modulator valve (17) in its bore in modulator valve body (16).
2. Place rear pump priming ball (15) into hydraulic modulator valve body (16), then place front and rear pump check valves and springs (13 and 14) into modulator body. Be sure the rear pump check valve (14), which contains the poppet, is installed in the outboard bore.
3. Carefully lower transfer plate (2) onto assembled components in hydraulic modulator valve body (16) so as not to knock front and rear pump check valves (13 and 14) from their springs, then secure transfer plate to modulator valve body (16) with two clutch head screws (1). Tighten screws to 38-50 inch pounds.
4. Install the low drive shift valve components in the main valve body (5). Place the low drive shift valve (6) into its main valve body bore, then assemble the inner and outer low drive springs (7 and 8) and place them in the bore. Insert the low drive regulator valve (10) into regulator valve sleeve (11), then place spring seat (9) over open end of regulator valve sleeve (11), and insert this assembly into bore in main valve body, compressing the inner and outer springs and secure by installing retainer ring with Truarc pliers.

5. Install throttle valve (23) into its bore in the main valve body (5), then install locating ring (25) in groove in throttle valve. Be sure throttle valve (26) is fully seated in its bore as locating ring (28) must be installed in throttle valve via third port from left of valve body as viewed in Figure 7E-11.
6. Place throttle valve spring (22) and detent valve assembly (21) in throttle valve bore, then depress detent valve assembly (21) and secure to valve body by tapping retaining pin (4) into main valve body (5).
7. Using a new transfer plate-to-main valve body gasket (3) apply a light coat of petroleum jelly to main valve body (5) and install gasket onto valve body. The purpose of petroleum jelly is to retain valve body and gasket alignment when transfer plate is installed.
8. Install pressure regulator valve (20) in the main valve body with spring (19) and spring retainer (18). Fully compress pressure regulator valve spring (19) so that spring retainer (18) enters bore of main valve body. Then position main valve body onto assembled transfer plate-hydraulic modulator body, align mounting screw holes in transfer plate and main valve body, and secure with two remaining clutch head screws (1). Tighten screws to 38-50 inch pounds.
9. Install manual valve (24) in main valve body, then check shift cable adjustment as described earlier in this section.

Inspection and Repairs—Low Servo Piston

To disassemble the low servo piston, remove the hairpin retainer securing the piston to the piston rod and separate all components. The cushion spring tension on this piston is relatively slight; no press is required.

Remove piston ring from the piston and install it in the low servo bore as illustrated in Figure 7E-12, then measure the ring gap. If within limits ring gap will be .002"-.012".

Assemble ring to piston, then measure clearance between ring and one wall of the piston groove (fig. 7E-13). Clearance should be .0005"-.005".

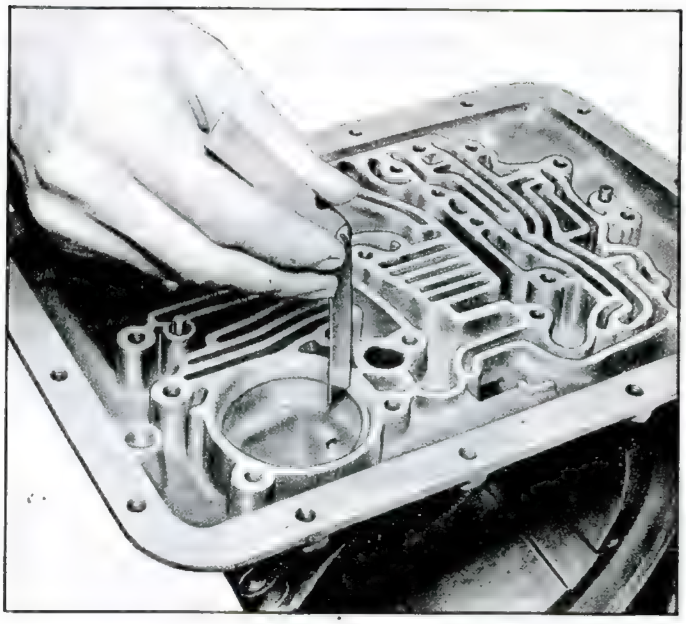


Fig. 7E-12—Measuring Low Servo Piston Ring Gap

To assemble the low servo, place the spring seat on the piston shaft, then install the cushion spring. Complete assembly by compressing cushion spring slightly with piston and secure piston to shaft with hairpin retainer.

Valve Body and Low Servo—Installation

1. Install low servo piston and return spring (fig. 7E-14) in bore in transmission and engage notch in piston shaft with low band apply strut, loosening low band screw slightly to permit piston ring to seat in case bore.
2. If low band was fully tightened to permit removal of low servo, install valve body in transmission while simultaneously loosening low band screw until it is possible to index the valve body on the dowels in case. If only valve body was removed and an improvised strap was employed, raise the valve body almost onto mating surface on case, then rotate improvised strap (fig. 7E-10) out of the way and secure valve body. If manual valve is installed index it with a manual valve lever in the case, then secure the valve body with 20 bolts (fig. 7E-15). Tighten bolts to 9-14 lbs. torque.
3. Install "O" ring seal in valve body, then install valve body screen assembly (fig. 7E-16).
4. Using a new pan gasket install transmission oil pan and torque pan attaching bolts to 3-4 ft. lbs. It is important that an even torque be applied to the pan bolts to prevent leakage between the oil pan and transmission case pan rail.
5. Tighten filler tube attaching nut, then refill transmission with oil as described under "Periodic Maintenance" earlier in this section.
6. If low band adjustment was disturbed, readjust low band as described earlier in this Section.

TRANSMISSION REMOVAL AND INSTALLATION

The removal and installation of the "Corvair" Powerglide from the vehicle is provided at the end of this Section.

SERVICE OPERATIONS—TRANSMISSION REMOVED FROM VEHICLE

All following service operations can be performed with the power train (transmission, axle, and engine) removed

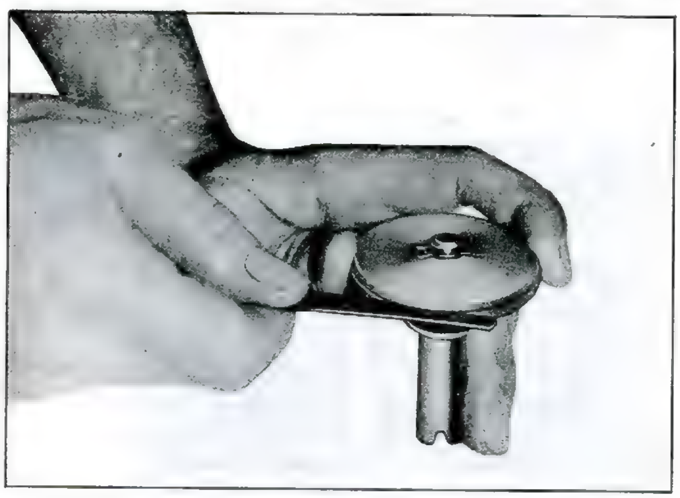


Fig. 7E-13—Measuring Piston-to-Ring Clearance

Fig. 7E-14—Installing Low Servo Piston and Return Spring

from the vehicle but not separated into individual assemblies if so desired. Refer to Section 6 for Power Train Removal procedures.

Disassembly of Transmission

1. If overhaul is being performed with transmission separated from power train, mount transmission in J-7896 holding fixture (fig. 7E-17). If assembled to power train, loosen the filler tube nut to allow oil to drain, then remove filler tube.
2. Remove the 12 bolts securing the front pump to the transmission case (fig. 7E-18).
3. If overhaul is being made with transmission installed on power train, loosen the low band adjusting screw jam nut and fully tighten the adjusting screw. This will prevent case components from being pulled out when the front pump is removed.
4. Using slide hammers J-6585 and front pump adapters J-6585-3, free the front pump from the case as shown (fig. 7E-19). Adapters can be installed in any of five inner mounting bolt holes as these connect the pump cover to the pump.
5. Remove the front pump cover (fig. 7E-20), then remove the pump shaft (fig. 7E-21). Use care in pump removal not to damage bushings in front pump body and turbine shaft with the pump shaft splines.
6. Remove the front pump body from the transmission case. Use care not to drop pump gears or loose the the priming valve, spring or spring seat.
7. Remove the front pump gasket.
8. To remove the clutch drum, loosen the low band adjusting screw and remove the low band, apply strut, and reaction strut (fig. 7E-22).

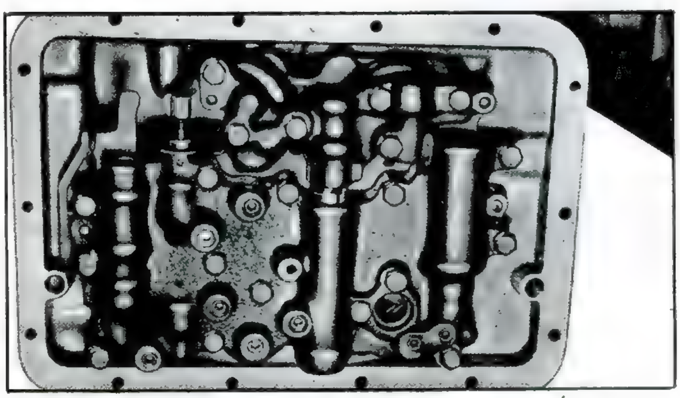


Fig. 7E-15—Valve Body Attaching Bolts

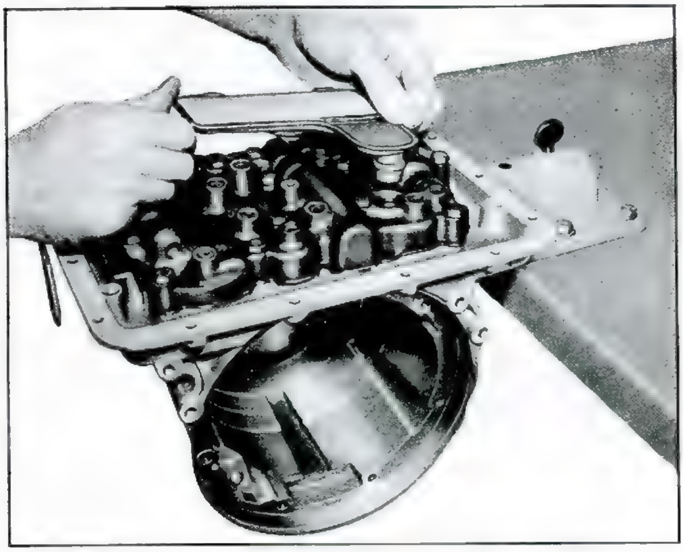


Fig. 7E-16—Installing Valve Body Screen

9. Remove the clutch drum (fig. 7E-23).

   CAUTION: If operations are being performed with the transmission on the power train, care should be taken not to disengage the ring gear from the reverse clutch face plates unless replacement of either the ring gear or reverse plates is anticipated. Engagement of the reverse plates and ring gear in the horizontal position is generally difficult and should not be attempted unnecessarily.

10. Remove the planet carrier from the ring gear and remove the turbine shaft. On disassemblies made with the transmission separated from the axle, the turbine shaft is removed with the separation of the two components.

This concludes extent of disassembly which should be attempted with the transmission assembled to the engine and differential. Although the reverse clutch plates are accessible without further tear-down, any failure of these plates can reasonably be assumed to be caused by malfunction of the reverse clutch, access to which requires

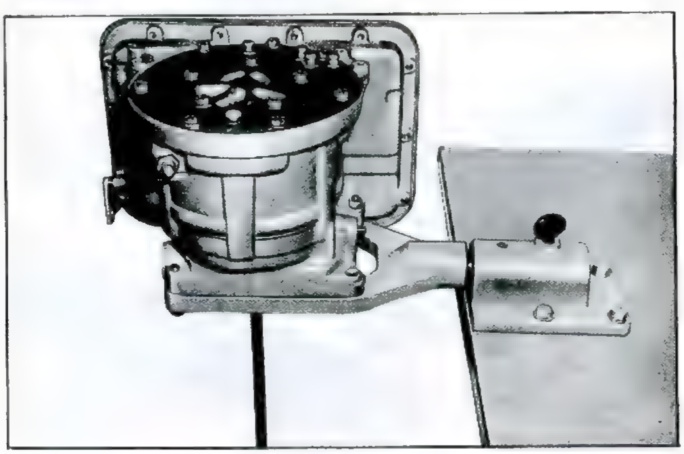


Fig. 7E-17—Transmission in Holding Fixture J-7896

Fig. 7E-18—Removing Front Pump Bolts

removal of the transmission from the power train.
The remaining disassembly operations can only be performed with the transmission separated from the power train.

11. Remove the ring gear (fig. 7E-24) from its engagement to the reverse clutch plates.
12. Remove the thick reverse reaction plate snap ring (fig. 7E-25).
13. Remove the thick reverse reaction plate, the three drive plates (faced), and the thin reaction plates (steel) (fig. 7E-26).
14. Remove the rear pump and reverse piston mounting bolt (fig. 7E-27) which are accessible from the rear (differential carrier side) of the transmission case.

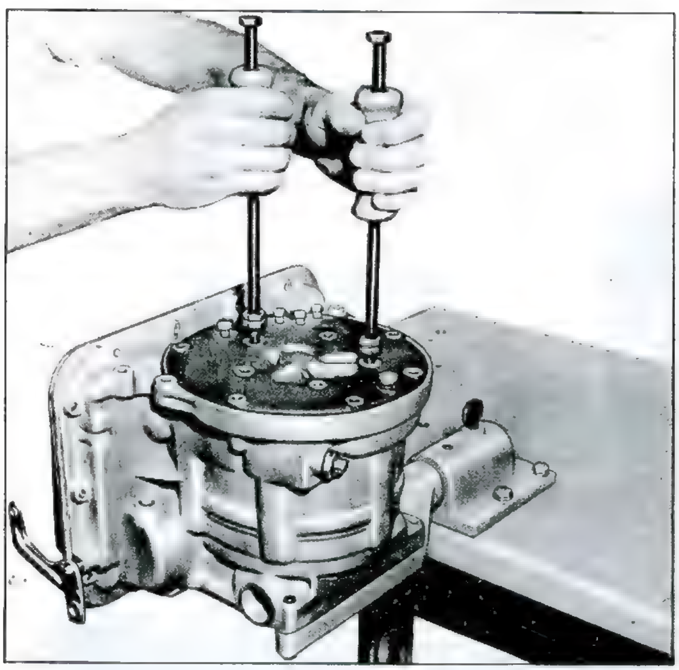


Fig. 7E-19—Removing Front Pump with Slide Hammers J-6585 and Adapters J-6585-3

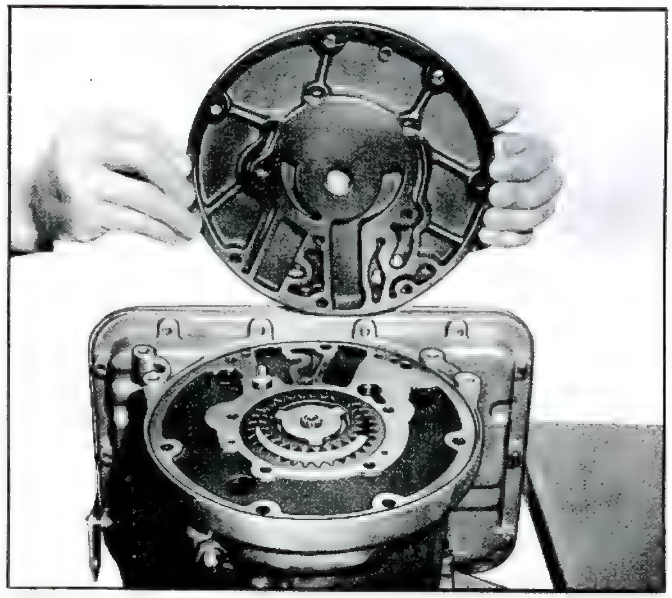


Fig. 7E-20—Removing Front Pump Cover

15. Remove the rear pump and reverse piston assembly (fig. 7E-28) by pulling forward with a twisting action.
16. Remove the rear pump wear plate (fig. 7E-28) from the rear of the transmission case.

This completes disassembly, except for the converter assembly. To remove the converter the rear axle must be removed from the engine as described in the Engine Section 6.

Inspection and Repair of Transmission Components

NOTE: All components in the following descriptions are shown in Figure 7E-29.

1. Wash all parts with solvent and dry with compressed air. Handle transmission case carefully to avoid damaging its finished surfaces as such damage could result in oil leakage.

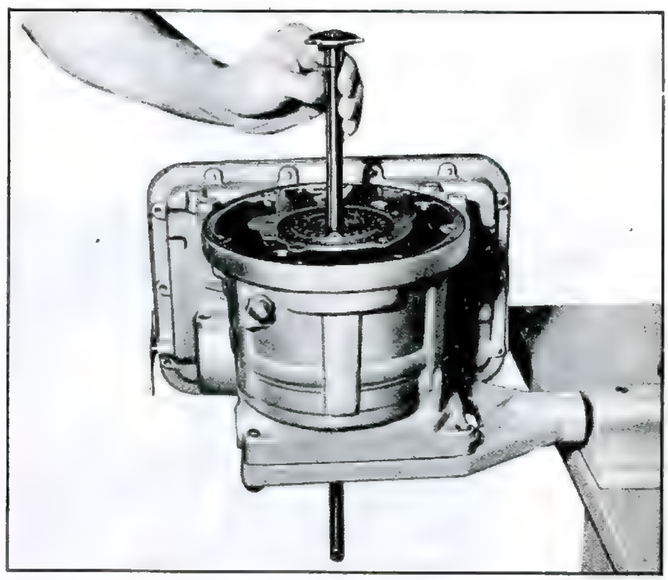


Fig. 7E-21—Removing Front Pump Drive Shaft

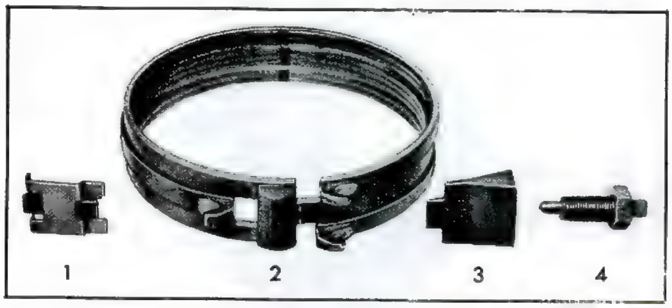


Fig. 7E-22—Low Band Components

1. Low Servo Piston Apply Strut
2. Low Band
3. Reaction Strut
4. Low Band Adjusting Screw and Locknut

2. Inspect all mating surfaces of the transmission case for nicks and other malfunctions and repair as required. Be especially careful to check the area around the manual shift cable as over-tightening the cable nut could possibly crack the case at this point. Check case bores for wear and grooves.
3. Inspect condition of the ring gear teeth and splines. Replace if damaged.
4. Inspect the governor drive gear, splines and teeth for wear and replace if necessary. Inspect rear pump wear plate for wear and abrasion; replace as required.
5. Inspect the condition of the reverse clutch drive plates (faced) and the reverse reaction plates (steel). If drive plate facing is worn or shows sign of intensive heat (which generally results in brittleness), replace. Reaction plates, unless external tangs are peened or damaged are generally serviceable even after failure of the drive plate.
6. Check manual valve and TV valve linkage. If damaged replace as required.
7. If necessary, remove the valve body screw assembly and clean. Also check that the "O" ring seal used between the pick-up and the valve body is in good condition.

Fig. 7E-23—Removing Clutch Drum

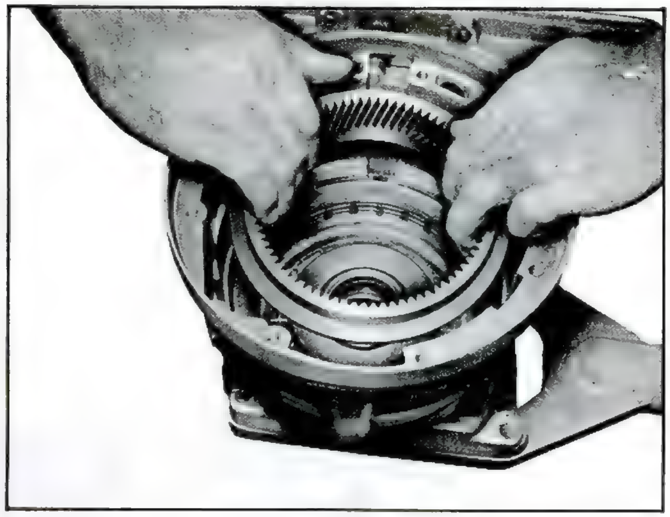


Fig. 7E-24—Removing Ring Gear

8. Inspect the condition of the low brake band. If band shows signs of excessive heat, brittleness of the facing can be expected and the band should be replaced.
9. Individual inspection and repair procedures are provided for the remaining transmission components. Check the applicable listing for inspection and repair of components not herein listed. The seven (7) bushings used in the transmission are called out in Figure 7E-30 and the applicable bushing installer is shown.

Front Pump

Inspection

1. Wash all parts in cleaning solvent and blow out all oil passages.

CAUTION: Do not use rags to dry parts.

2. Inspect pump gears for nicks or damage. Check gear for wear at its bearing surface on the inner diameter where it mates with the pump journal.

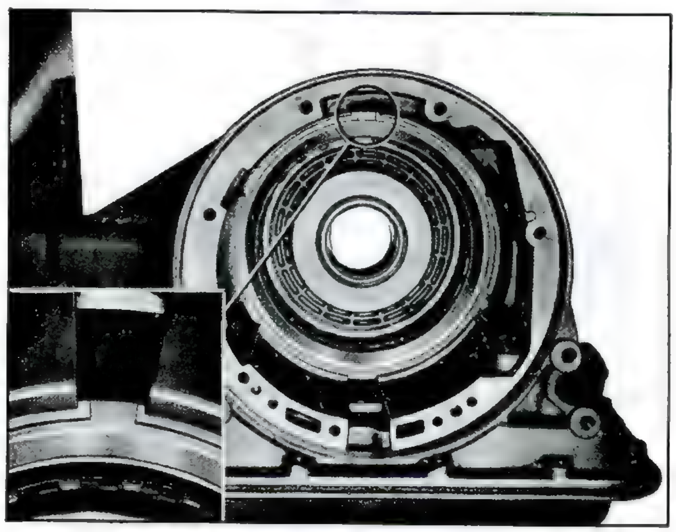


Fig. 7E-25—Reverse Clutch Pack Retainer Ring

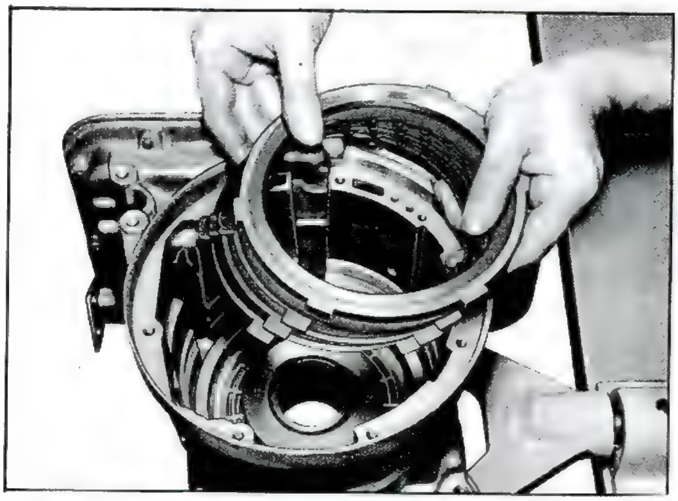


Fig. 7E-26—Removing Reverse Clutch Plates

3. Inspect cover face for nicks or scoring.
4. Inspect pump body for nicks or scoring.
5. With parts clean and dry, install pump gears and check:
   a. Clearance between O.D. of driven gear and body should .0025".005" (fig. 7E-31).
   b. Clearance between driven gear and crescent should be .003"-.009" (fig. 7E-32).
   c. With scale and feeler gauge check gear end clearance. This clearance should be .0005" to .0015" (fig. 7E-33).
   d. Inspect pump drive gear teeth for interference between tops of gear teeth and the crescent in the pump.
6. Replace gasket and square cut seal ring in O.D. of front pump cover. Also check condition of cast iron seal rings on pump body hub; replace as necessary.
7. Check the front pump priming valve for freedom of operation. (fig. 7E-60) If replacement is necessary either the priming valve, spring or spring washer may be replaced separately.
8. Check the condition of the front pump body bushing. If worn or damaged, replace as described in the following procedure.

Front Pump Body Bushing Replacement

1. Remove bushing with a chisel or other suitable tool. Use care not to damage pump body bore.
2. Install new pump body bushing as illustrated (fig. 7E-34) using J-8360-5.

Clutch Drum

Disassembly

NOTE: All number references are to Figure 7E-35.

1. Remove retainer ring (15) securing the low sun gear and clutch flange assembly (14) to the clutch drum (2).
2. Remove the low sun gear and clutch flange (14) and hub rear thrust washer (13).
3. Lift out clutch hub (12), then remove the nested drive and reaction plates (9 and 10) and the hub front thrust washer (11).

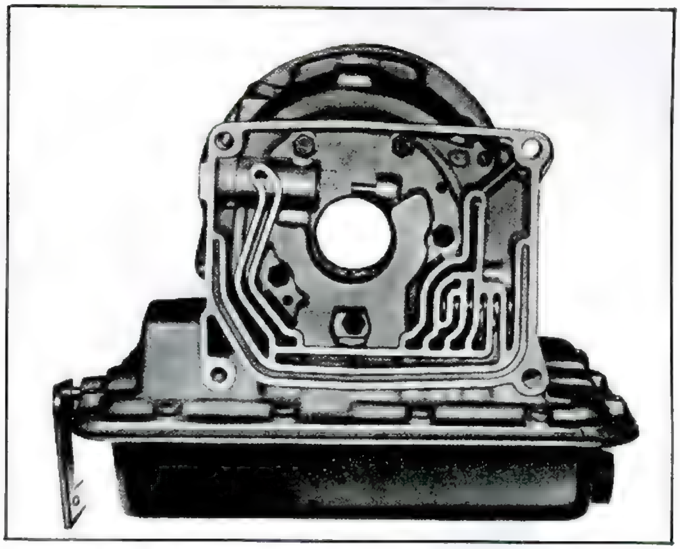


Fig. 7E-27—Rear Pump Mounting Bolts

4. To remove the spring retainer (7), place the clutch drum in a press and compress the springs using J-7782 adapter ring and J-5133 as shown (fig. 7E-36). Then remove snap ring (8) with Truarc pliers.
5. Carefully release pressure on press, then remove spring retainer (7) and return springs (6).
6. To remove clutch piston (5) pull upward with a twisting motion on the center, then remove piston seal (4).
7. To complete disassembly, remove piston inner seal (3) from hub of clutch drum (2).

Inspection

1. Wash all parts in cleaning solvent (air dry).

   CAUTION: Do not use rags to dry parts.

2. Inspect drum brake band surface for excessive scoring or burning. Also, check drum bushing for scoring or excessive wear.

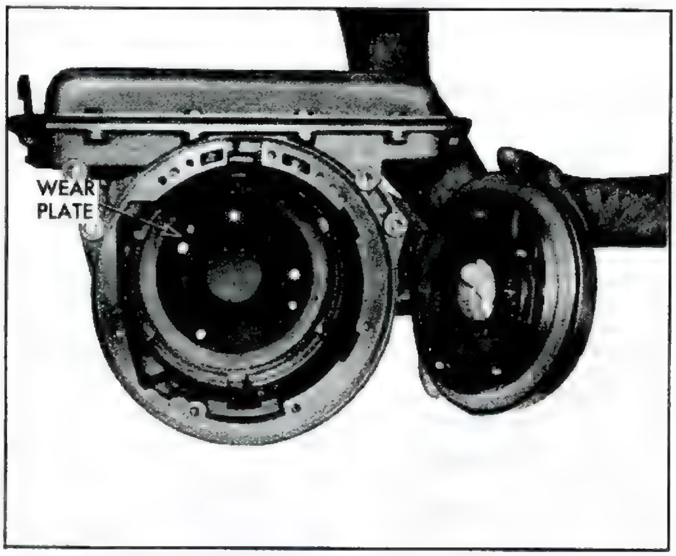


Fig. 7E-28—Removing Rear Pump and Reverse Piston Assembly

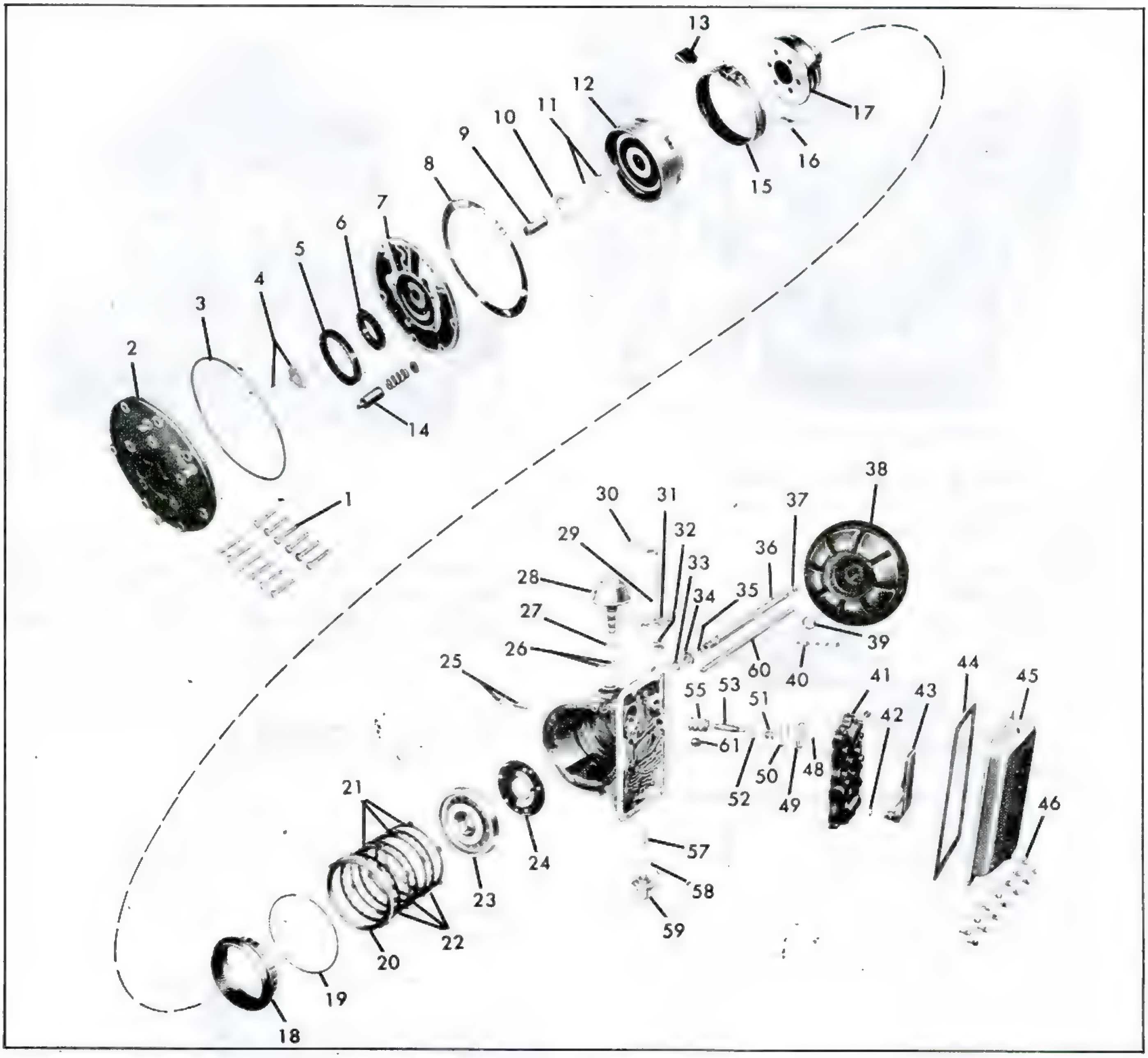


Fig. 7E-29—"Corvair" Powerglide—Exploded View

1. Front Pump Mounting Bolts
2. Front Pump Cover
3. Front Pump Seal Ring
4. Front Pump Shaft Drive Hub Thrust Washer and Retaining Rings
5. Front Pump Driven Gear
6. Front Pump Drive Gear
7. Front Pump Body
8. Front Pump Gasket
9. Front Pump Body Bushing
10. Clutch Drum Selective Thrust Washer
11. Front Pump Body Hub Iron Seal Rings
12. Clutch Drum Assembly
13. Low Band Reaction Strut
14. Front Pump Priming Valve, Spring, Seat
15. Low Band
16. Low Band Apply Strut
17. Planet Carrier Assembly
18. Ring Gear
19. Reverse Clutch Plates Retaining Ring
20. Reverse Clutch Front Reaction Plate (Thick)
21. Reverse Clutch Reaction Plates
22. Reverse Clutch Faced Plates
23. Rear Pump and Reverse Piston Assembly
24. Rear Pump Wear Plate
25. Low Band Adjusting Screw and Locknut
26. Governor Driven Gear and Retaining Pin
27. Governor "O" Ring Seal
28. Governor Assembly
29. Transmission Throttle Valve Lever Shaft Seal
30. Transmission Throttle Valve Lever and Shaft Assembly
31. Manual Valve Lever
32. Transmission Throttle Valve Inner Lever
33. Governor Gear Thrust Spacer
34. Governor Drive Gear
35. Turbine Shaft Front Bushing
36. Turbine Shaft
37. Turbine Shaft Rear Bushing
38. Converter Assembly
39. Converter Hub Bushing
40. Rear Pump and Reverse Piston Assembly Attaching Screws
41. Valve Body Assembly
42. Valve Body Screen "O" Ring Seal
43. Valve Body Screen Assembly
44. Oil Pan Gasket
45. Oil Pan
46. Oil Pan Attaching Screws
48. Low Servo Piston Retaining Clip
49. Low Servo Piston
50. Low Servo Piston Ring
51. Low Servo Piston Cushion Spring
52. Low Servo Piston Cushion Spring Seat
53. Low Servo Piston Shaft
55. Low Servo Piston Return Spring
57. Vacuum Modulator Valve
58. Vacuum Modulator Gasket
59. Vacuum Modulator
60. Front Pump Shaft
61. Downshift Timing Valve

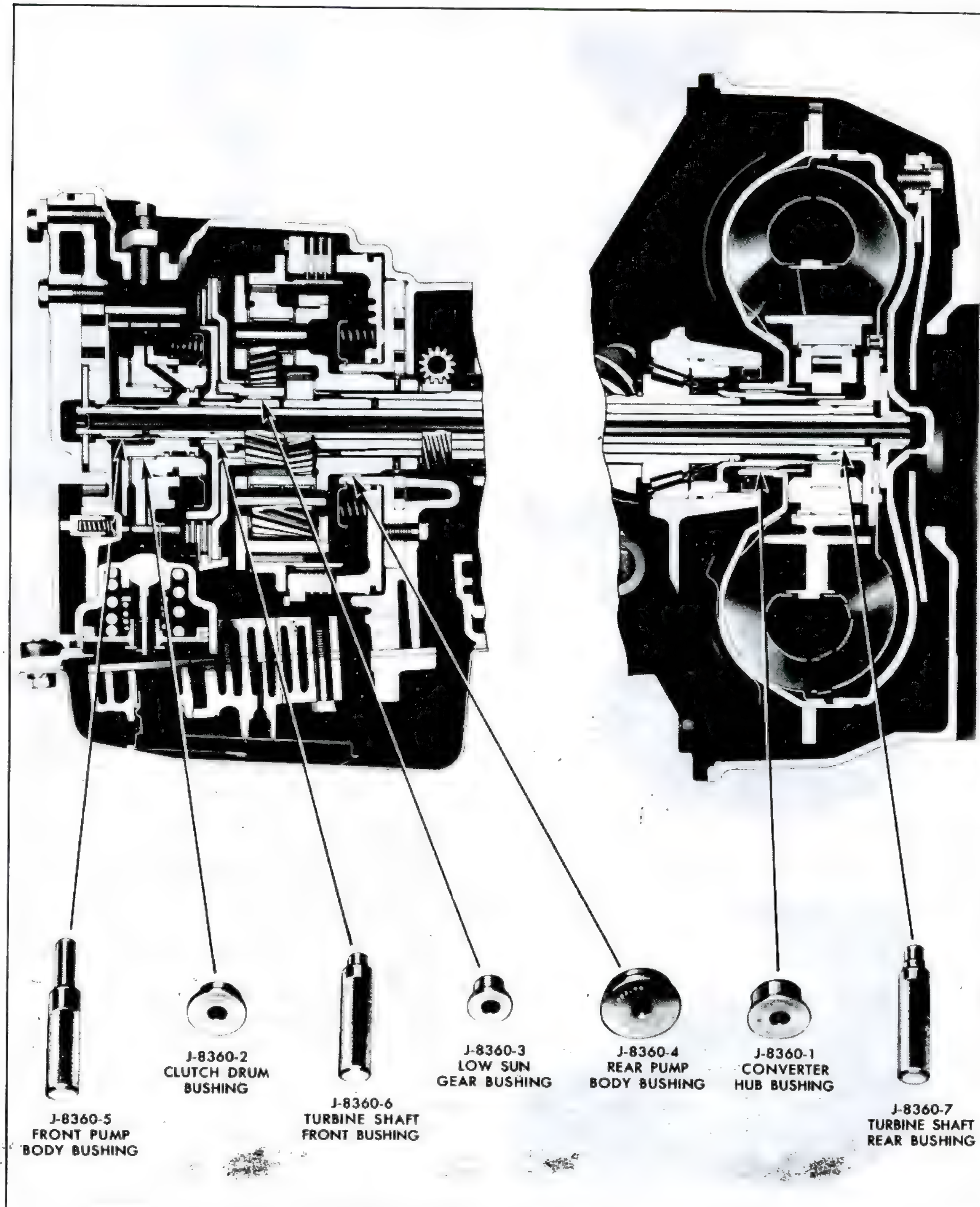


Fig. 7E-30—Powerglide Bushings and Installers

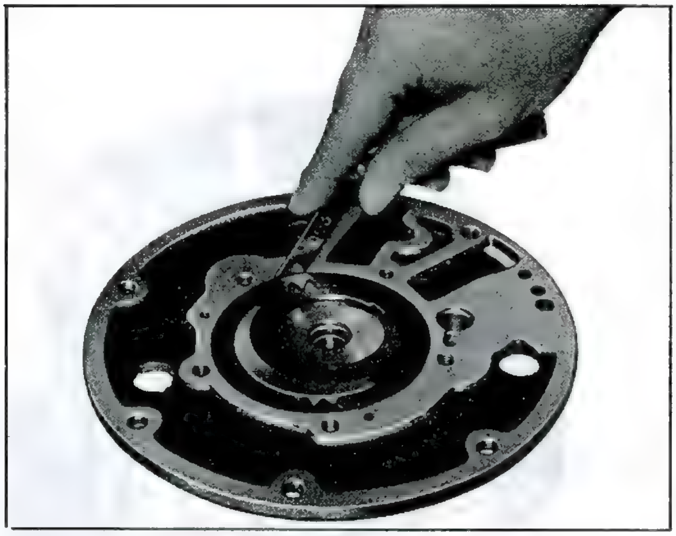


Fig. 7E-31—Checking Driven Gear-to-Pump Body Clearance

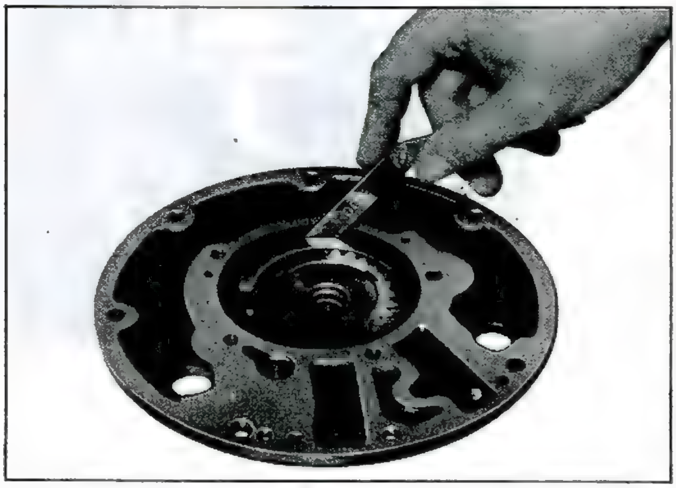


Fig. 7E-32—Checking Driven Gear-to-Crescent Clearance

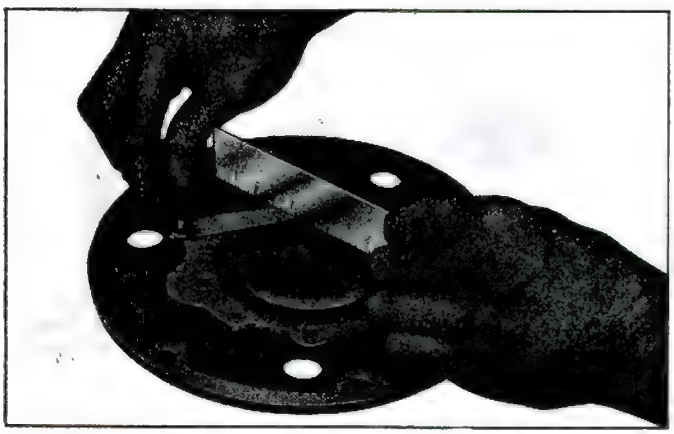


Fig. 7E-33—Checking Front Pump Gear End Clearance

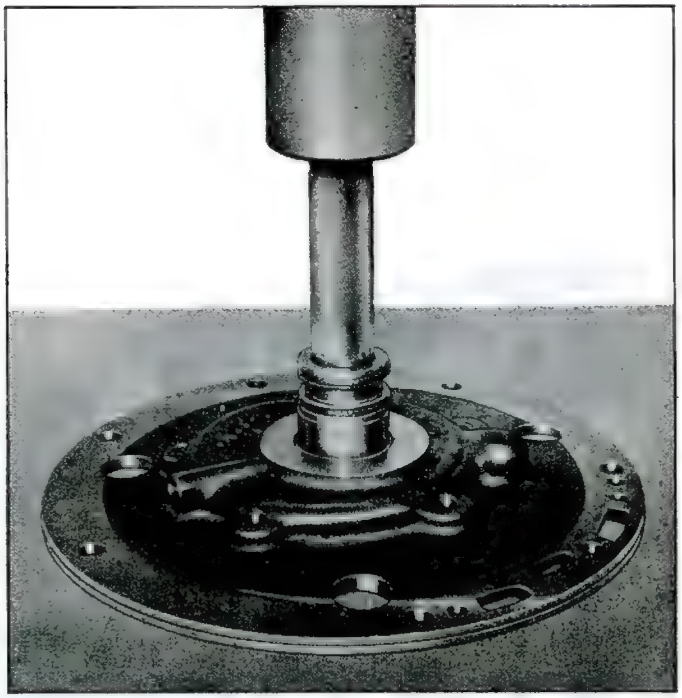


Fig. 7E-34—Installing Front Pump Bushing with J-8360-5

3. Check the steel ball in the clutch drum that acts as a relief valve. Be sure that it is free to move in the hole and that the orifice leading to the front of the drum is open. If the clutch relief valve check ball in the clutch drum is loose enough to come out or not loose enough to rattle, replace the clutch drum as an assembly. Replacement or restaking of the ball should not be attempted.
4. Check fit of clutch flange in drum slots. There should be no appreciable radial play between these two parts. Also check low sun gear for nicks or burrs and bushing for wear.
5. Check clutch plates for burning and wear. The faced plates are now symmetrically waved and the steel reaction plates are flat.

   CAUTION: Do not use the new waved face plates with the waved steel plates used formerly.

Clutch Drum Bushing Replacement

1. Remove the old bushing with a chisel or other suitable tool using care not to damage the bushing bore.
2. Install new bushing with J-8360-2 (fig. 7E-30).

Low Sun Gear Bushing Replacement

1. Remove old bushing with a chisel or other suitable tool using care not to damage the bushing bore.
2. Install new bushing with J-8360-3 (fig. 7E-30).

Assembly

NOTE: All number references are to Figure 7E-35.

1. Install piston inner seal (3) in hub of clutch drum (2). Be sure seal lips are downward (or toward the front of the transmission).
2. Install a new piston seal (4) in clutch piston (3). Be sure seal lips are toward front of transmission

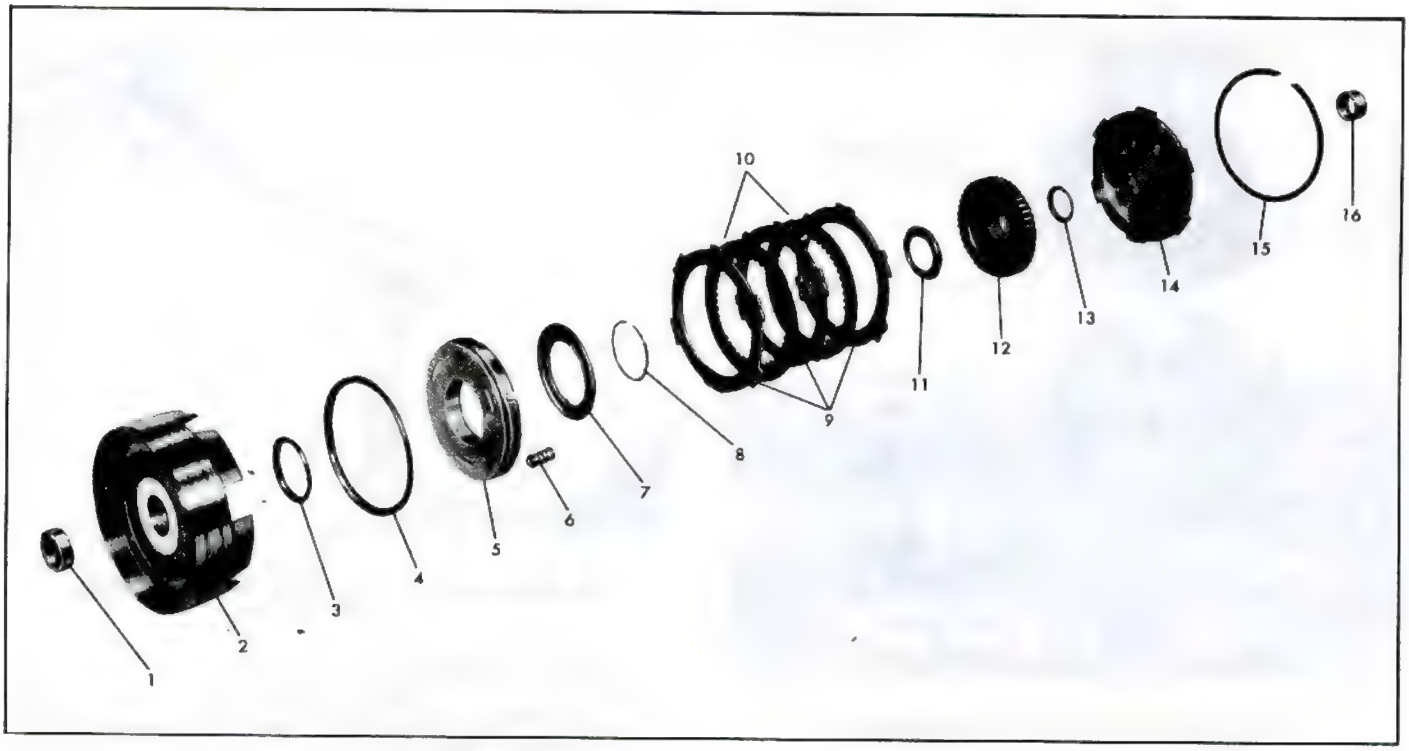


Fig. 7E-35—Clutch Drum—Exploded View

1. Clutch Drum Bushing
2. Clutch Drum
3. Clutch Piston Inner Seal
4. Clutch Piston Outer Seal
5. Clutch Piston
6. Clutch Piston Return Spring (15 Used)
7. Return Spring Retainer
8. Return Spring Retainer Snap Ring
9. Reaction Plates (flat)
10. Face Plates (waved)
11. Clutch Hub Thrust Washer
12. Clutch Hub
13. Clutch Hub-to-Clutch Flange Thrust Washer
14. Clutch Flange and Low Sun Gear Assembly
15. Clutch Flange Retaining Ring
16. Low Sun Gear Bushing

(clutch drum) when installed. Lubricate both the piston inner seal (3) and the piston seal (14), then install clutch piston (5) in clutch drum with a twisting motion.

3. Place the 15 return springs (6) in position on the clutch piston, then place the spring retainer (7) on the springs.
4. Place the clutch drum in a press, position the snap ring (8) on the clutch drum hub, then compress the springs, using J-5133 and J-7782 as previously illustrated in Figure 7E-36. With springs fully compressed, install snap ring (8) in groove on clutch drum hub with the Truarc pliers.
5. Install hub front thrust washer (11) with its lip toward the clutch drum, then install the clutch hub (12).
6. Install three steel reaction plates (9) and two faced drive plates (10) alternately starting with a steel reaction plate (fig. 7E-37).

   NOTE: It is not necessary to stack face plates so waved areas match.

7. Install the hub rear thrust washer (13) with its flange toward the low sun gear, then install the low sun gear and clutch flange assembly (14) and secure with retainer ring (15). Finally installed openings of retainer ring (15) should be adjacent to one of the lands of the clutch drum as illustrated in Figure 7E-38.
8. Check the assembly by turning the clutch hub to insure it is free to rotate.

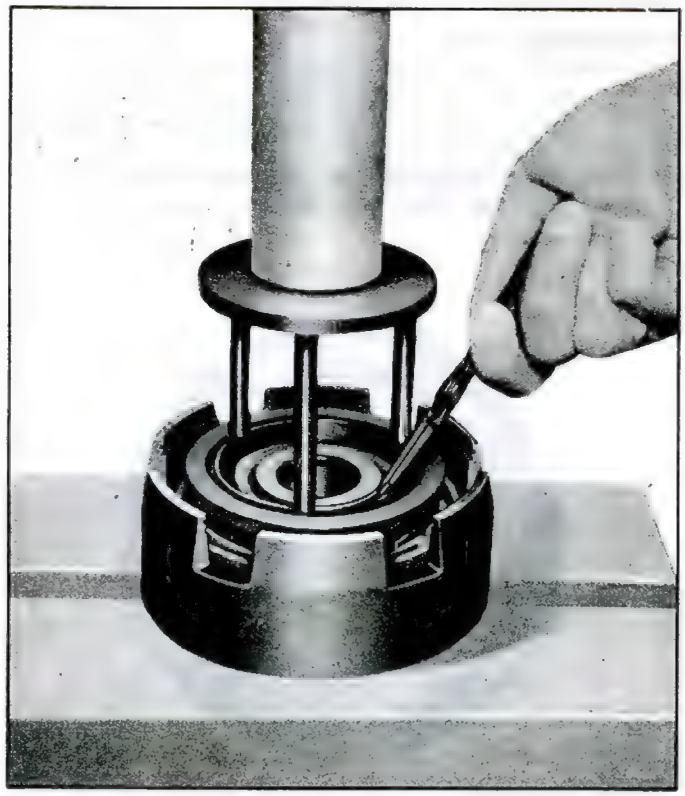


Fig. 7E-36—Removing Clutch Drum Spring Retainer with J-5133 and J-7782

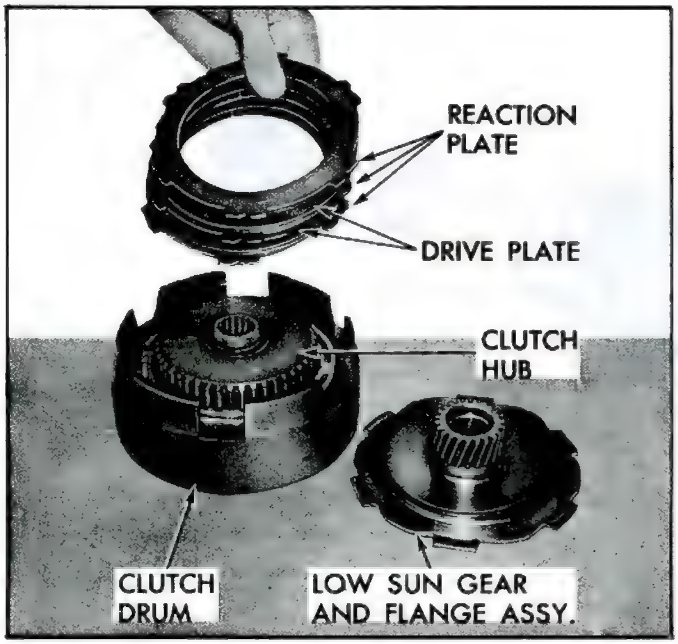


Fig. 7E-37—Installing Clutch Drum Plates

Turbine Shaft

Inspection

Check the shaft for nicks and cracks and check the splined areas for wear. Check that the two lube holes are open. Also inspect the bushings for condition, and if necessary, replace as described below.

Bushing Replacement

The two bushings used in the turbine shaft are identical, however, the depth to which they are installed varies. Figure 7E-30 illustrates the bushing installer to be used at each location.

1. To remove the old bushing, cut it out with a chisel or suitable tool. Use care not to damage the bore.

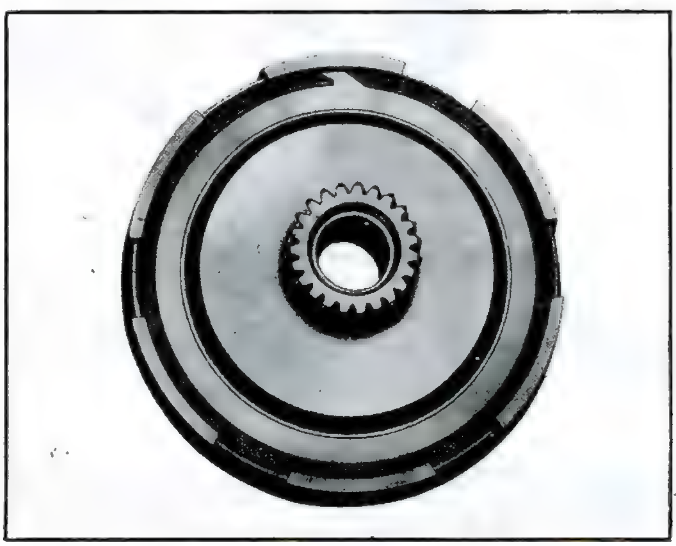


Fig. 7E-38—Clutch Flange and Low Sun Gear Retainer Ring Installation

Fig. 7E-39—Installing Front Pump Shaft Thrust Washer Drive Hub Snap Ring

2. Install new bushing as illustrated:
   a. The front bushing should be installed with J-8360-6. The front is the end of the shaft with the two splined areas.
   b. The rear bushing should be installed with J-8360-7.

Pump Shaft

Inspection

Check the splines at the converter end of the shaft for wear or damage. Inspect the bronze faced drive lugs of the thrust washer for peened edges and wear of its splined connection to the shaft by twisting to check for looseness. Be especially careful to check that the thrust washer drive hub is tightly retained by the snap ring.

Repairs

If bronze thrust washer drive hub is worn remove the top snap ring (fig. 7E-39) and replace it.

Rear Pump and Reverse Piston Assembly

Disassembly

NOTE: All number references in this procedure are to Figure 7E-40.

1. Remove the drive gear (9) and driven gear (10) from pump body (8).
2. Place the assembly in a press with the pump body on wood or other soft material, then compress the spring retainer (2) with J-7782 and J-5133 as illustrated in Figure 7E-41.
3. With spring retainer (2) compressed until springs bottom, remove snap ring (1). Carefully release pressure, then remove spring retainer (2) and return springs (4).
4. In order to remove the reverse piston (5), it is necessary to fill the groove for snap ring (1) in the hub of the rear pump body with string, a small rubber band or a similar size "O" ring. Once the groove is filled, the rear pump body (8) can be pushed out of the reverse piston bore.
5. Remove the square cut piston inner seal (3) and piston outer seal (6). Seals should be discarded and new seals installed at reassembly.

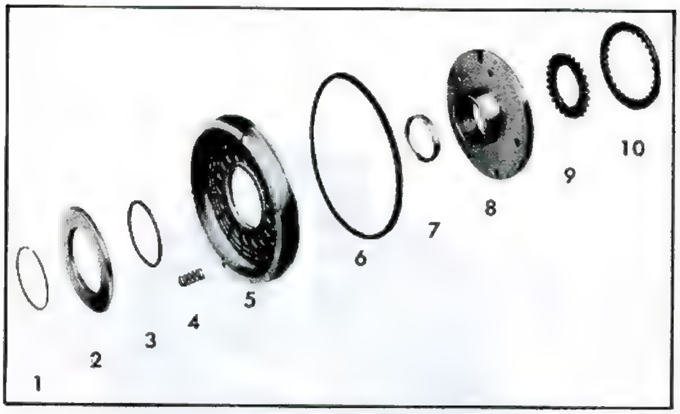


Fig. 7E-40—Rear Pump and Reverse Piston—Exploded View

1. Spring Retainer Snap Ring
2. Spring Retainer
3. Reverse Piston Inner Seal
4. Reverse Piston Return Springs (17 Used)
5. Reverse Piston
6. Reverse Piston Outer Seal
7. Rear Pump Body Bushing
8. Rear Pump Body
9. Rear Pump Drive Gear
10. Rear Pump Driven Gear

Inspection

1. Wash all parts in clean solvent and dry with compressed air.
2. Check fit of rear pump drive and driven gears as described earlier in this section under "Front Pump Overhaul." Fits and tolerances of the rear pump gears are identical to those of the front pump.
3. Inspect pump body for leaks and scoring. Check hub of pump body for smoothness. Any burrs on this surface would cause leakage and could result in a jammed reverse piston.

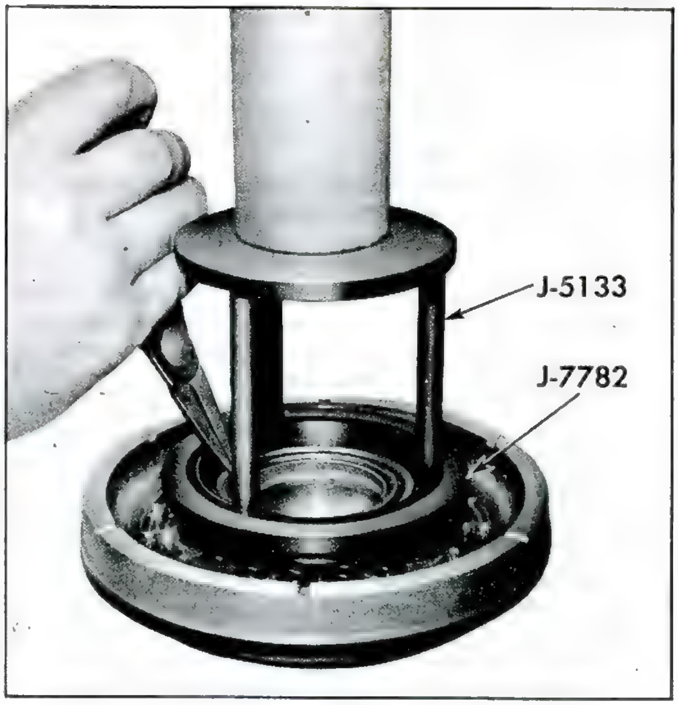


Fig. 7E-41—Removing Reverse Piston Return Spring Retainer with J-5133 and J-7782

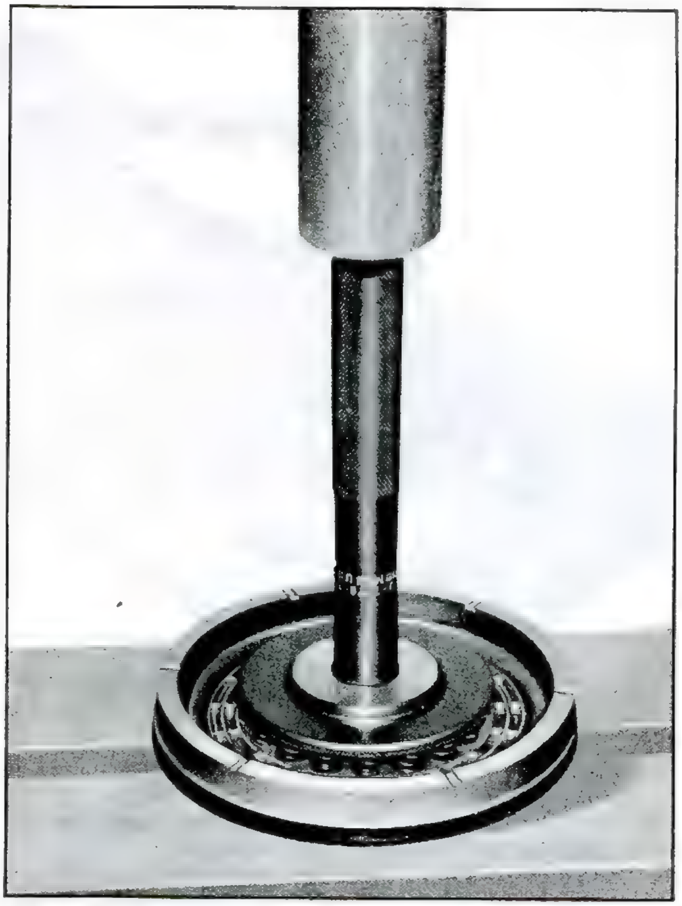


Fig. 7E-42—Installing Rear Pump Body Bushing with J-8360-4 and Handle J-7079-2

4. Check for broken piston return springs and make a comparative check of spring heights by standing all of the springs in a row. If appreciable variance in spring height is noticed, replace springs.
5. Check condition of rear pump body bushing. If scored or worn, replace.

Rear Pump Body Bushing Replacement

1. Remove old bushing with a chisel or suitable tool, using care not to damage pump body bore.
2. Install new bushing as illustrated in Figure 7E-42, using J-8360-4.

Assembly

NOTE: All number references in this procedure are to Figure 7E-40.

1. Install piston inner seal (3) in reverse piston (5).
2. Install piston outer seal (6) in piston (5).
3. Install reverse piston (5) on rear pump body (8). It is not necessary to fill snap ring groove on pump body hub for installation of piston. Pitch of groove for snap ring (1) is favorable for installation.
4. Position 17 return springs (4) in their seats on the reverse piston (5), then place spring retainer on springs.
5. Place unit in a press with wood or other soft material between the press bed and the rear pump body (8), place snap ring (1) on hub of rear pump

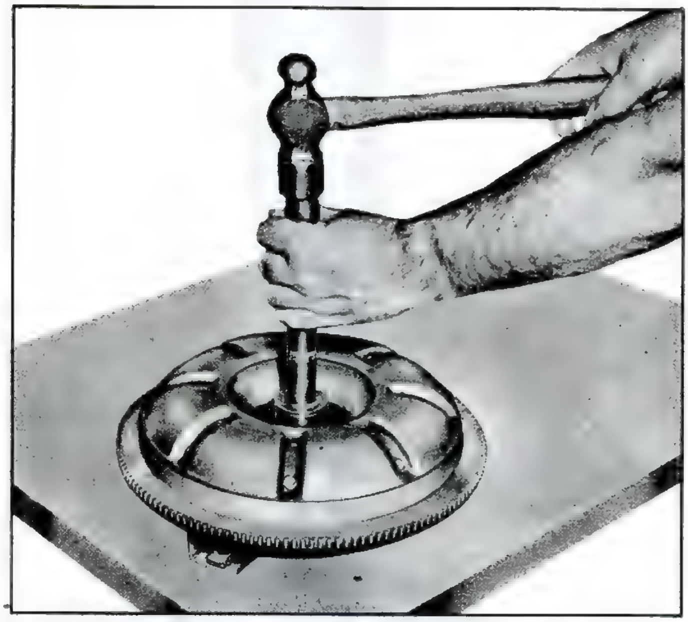


Fig. 7E-43—Installing Converter Hub Bushing with J-8360-1 and Handle J-7079-2

body, then compress springs using J-7782 and J-5133 as previously illustrated in Figure 7E-41.

6. With springs fully compressed, install snap ring (1) in its groove in the rear pump body (8).
7. Complete assembly by installing drive gear (9) and driven gear (10) in their respective bores in the pump body (8). It is advisable to apply a small amount of petroleum jelly to the gears to prevent their being dropped from the pump body.

Converter

Inspection

NOTE: It is unnecessary to drain converter as it is welded and no internal repairs can be made.

1. Check starter gear for worn or broken teeth and for broken welds at its attachment to the converter assembly. If starter gear is undamaged but welds are loose or broken, reweld as required.
2. Check converter seams for stress or breaks and either replace converter or repair welds as required. If welds are repaired, keep added material to a minimum by carefully chipping off all scale and filing away any unnecessary weld to retain converter balance as close to original as possible. Replace the converter if roughness due to unbalance is noted after reassembly to the engine.

Converter Bushing Replacement

1. Remove old bushing with a chisel or other suitable tool, using care not to damage converter bore.
2. Install new bushing, using J-8360-1 as illustrated (fig. 7E-43).

Planet Carrier Assembly

Inspection

1. Wash planet carrier in cleaning solvent, blow out all oil passages and air dry.

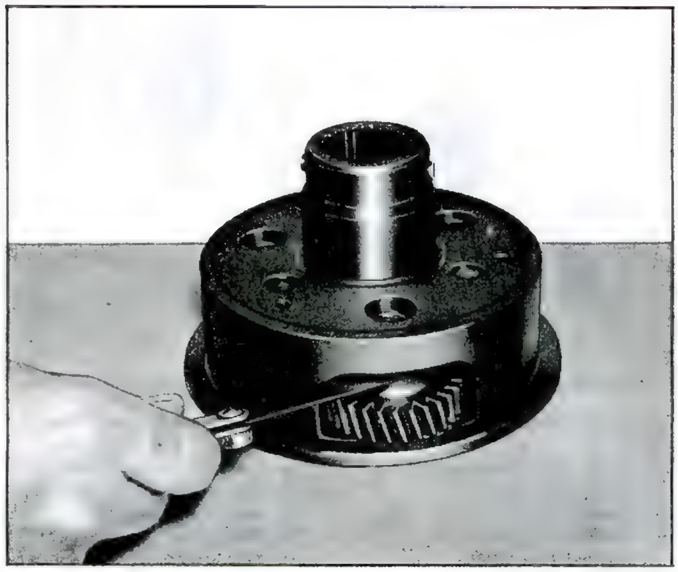


Fig. 7E-44—Checking Planet Gear End Clearance

CAUTION: Do not use rags to dry parts.

2. Inspect planet pinions for nicks or other tooth damage.
3. Check end clearance of planet gears. This clearance should be .005"-.035" (fig. 7E-44).
4. Check input sun gear for tooth damage, also check input sun gear and low sun gear thrust washers for damage.
5. Inspect planet carrier splines for nicks or damage. Also, check pinion shaft ends for proper staking.

Repairs

If during inspection, the planet pinions, pinion needle bearings, pinion thrust washers, input sun gear, low sun gear thrust washer and/or input sun gear thrust washer should show excessive wear or damage, they should be replaced using the following procedure.

Refer to Figure 7E-45.

1. Place the planet carrier assembly in a fixture or vise with the splined end facing down.
2. Starting with a short planet pinion, and using a soft steel drive, drive on the upper end of the pinion shaft until the pinion shaft is driven beyond the staked positions and pressed fit area of the carrier housing. Feed J-9560-1 into the short planet pinion from the upper end (fig. 7E-46), pushing the planet pinion shaft ahead until the tool is centered in the pinion.
3. Remove the short planet pinion and lower pinion thrust washer from the assembly. Complete removal of pinion shaft from assembly.
4. Remove J-9560-1, needle bearings and needle bearing washers (2) from the short planet pinion.

CAUTION: Use care so as not to lose any of the planet pinion needle bearings. Twenty needle bearings (long) are used with the short planet pinion. Forty needle bearings (short) are used with the long planet pinion, twenty on each end with a spacer in the middle.

5. Remove and disassemble the remaining short planet pinions.

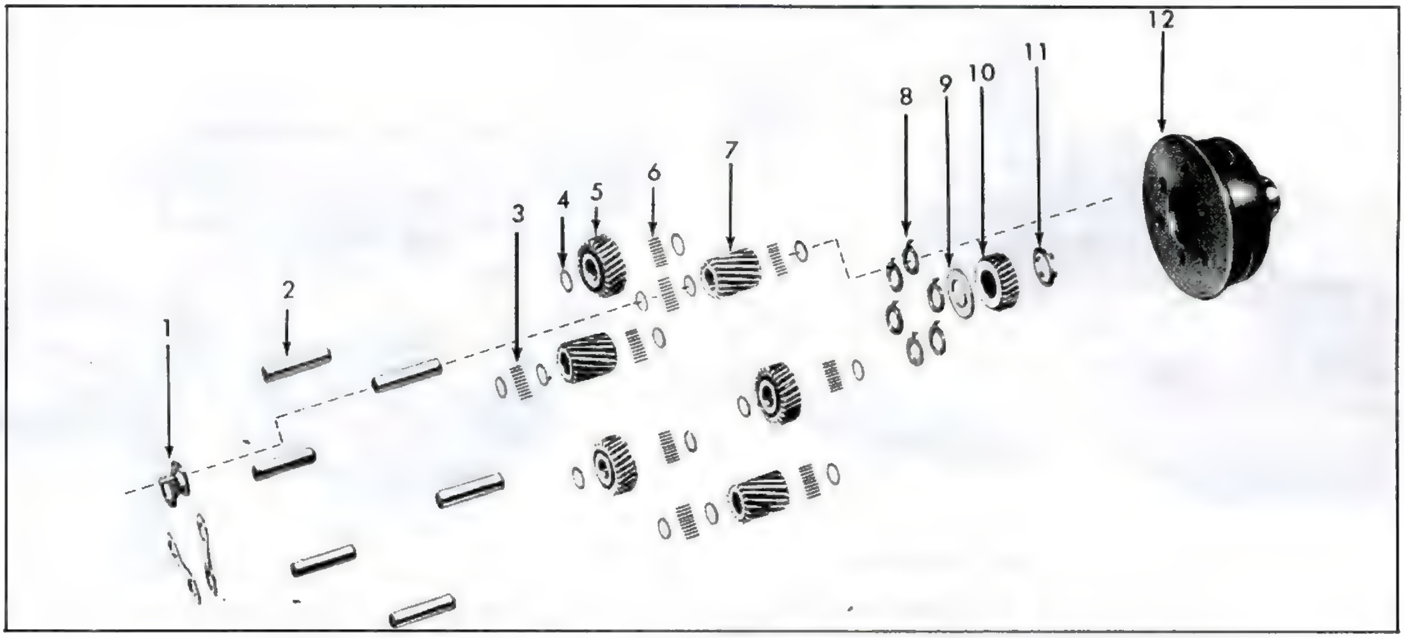


Fig. 7E-45—Planet Carrier Assembly—Exploded View

1. Pinion Front Thrust Washers
2. Pinion Shafts
3. Needle Bearings—Short
4. Needle Bearing Washers
5. Short Planet Pinion Gear
6. Needle Bearings—Long
7. Long Planet Pinion Gear
8. Pinion Rear Thrust Washers
9. Low Sun Gear Needle Thrust Bearing
10. Input Sun Gear
11. Input Sun Gear Thrust Washer
12. Planet Carrier

6. Remove the low sun gear thrust washer, input sun gear and input sun gear thrust washer.
7. By following the procedure as outlined in Steps 2, 3, and 4, remove the long planet pinions with J-9560-2 and upper and lower pinion thrust washers.
8. Wash all parts in cleaning solvent and air dry.
9. Recheck the planet pinion gears and input sun gear for nicks or other tooth damage, also check the planet pinion thrust washers, low sun gear thrust washer and input sun gear thrust washer. Replace worn or damaged parts.
10. Inspect the planet pinion needle bearings closely and, if excessive wear is evident, all the needle bearings must be replaced. Also, inspect pinion shafts closely and, if worn, replace the worn shafts.

Assembly

1. Using J-9560-2 assemble needle bearing spacer and short needle bearings (20 in each end) in one of the long planet pinions. Use petroleum jelly to aid in assembling and holding the needle bearings in position. Place needle bearing washer at each end of planet pinion.
2. Reverse position of carrier in fixture.
3. Position the long planet pinion, with J-9560-2 centered in the pinion assembly and with thrust washers at each end, in the planet carrier. Oil grooves on thrust washers must be toward gears. Align thrust washers with the carrier holes.

NOTE: The long planet pinions are located opposite the closed portions of the carrier, while the short planet pinions are located in the openings.

4. Select the proper pinion shaft, lubricate the shaft and install it by tapping with a hammer (fig. 7E-47), pushing the assembling tool ahead of it.
5. With a brass or soft steel drift, drive the pinion shaft until the lower end engages the staked positions on the lower face of the carrier.
6. Assemble and install the remaining long planet pinions.

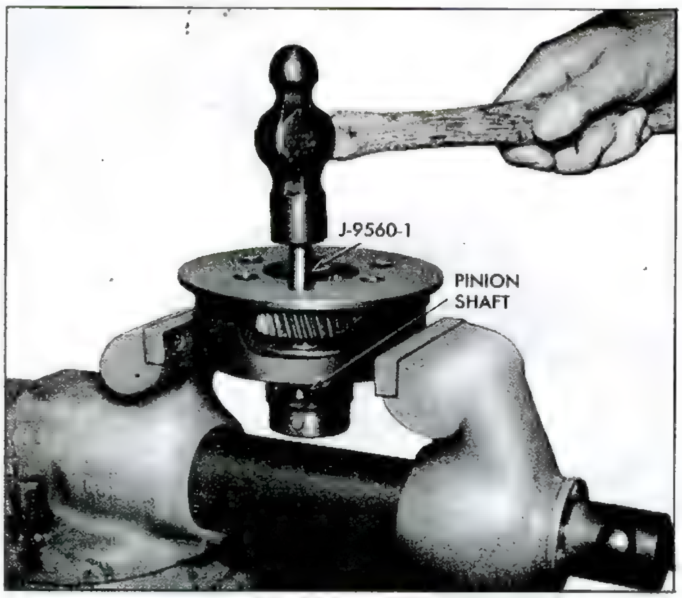


Fig. 7E-46—Removing Short Planet Pinion

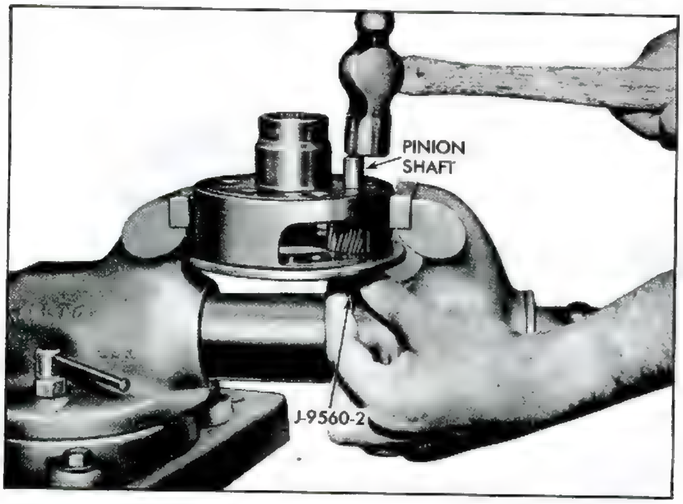


Fig. 7E-47—Installing Long Planet Pinion

7. Install the input sun gear thrust washer, input sun gear and low sun gear thrust washer.
8. Following the same general procedure as outlined in Steps 11-15, assemble and install the short planet pinions in the planet carrier. Each short pinion uses 20 long needle bearings with a needle bearing washer on each end.

   NOTE: Paired thrust washers are used on the pinion thrust surface toward the flanged side of the planet carrier, from the short to the long planet pinions while the opposite thrust surface has an individual thrust washer.

9. Check end clearance of planet gears. This clearance should be .005"-.035" (fig. 7E-44).

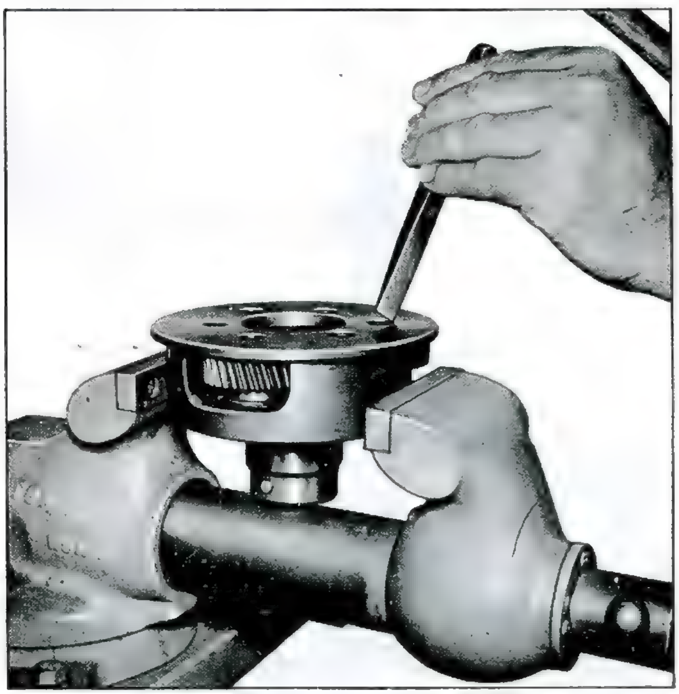


Fig. 7E-48—Staking Planet Pinion Shaft

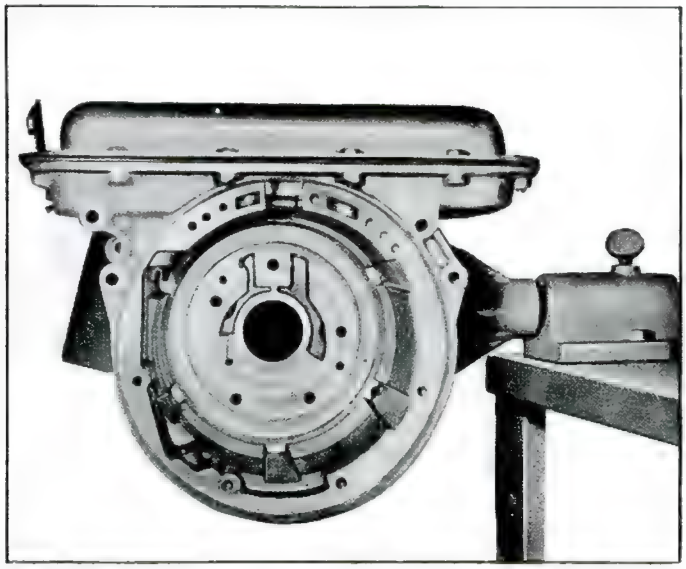


Fig. 7E-49—Transmission Case Installed in Holding Fixture J-7896

10. Using a chisel or center punch, restake the pinion shaft at four places on both ends of planet carrier (fig. 7E-48).

Assembly of Transmission

NOTE: The following steps apply only if the transmission is separated from the Power Train.

1. Install transmission case in holding fixture J-7896 (fig. 7E-49).
2. Install two improvised guide pins of approximately 2-1/2" to 3" in rear pump bolt holes (5/16"-18), then install rear pump wear plate on guide pins, using a small amount of petroleum jelly to hold wear plate in place.
3. Insert rear pump and reverse piston with guide pins into case, then insert a length 1/2" to 3/4" wide of .010"-.015" shim stock between piston outer seal and case. With rear of case downward, running the shim stock around the entire diameter of the seal will seat the seal quickly.

   Remove the guide pins and install five rear pump mounting bolts (fig. 7E-50), securing to 9-11 ft. lbs.

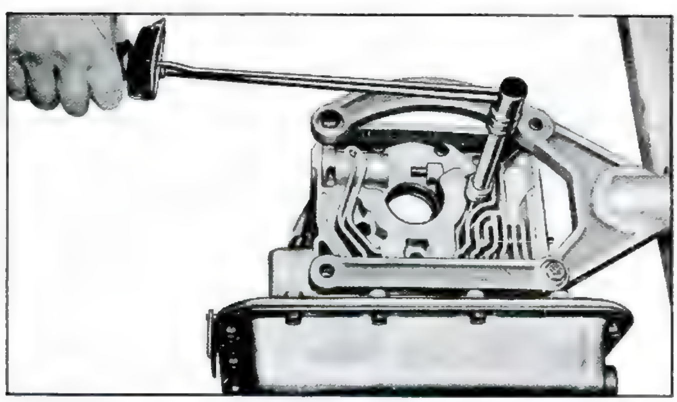


Fig. 7E-50—Measuring Rear Pump and Reverse Piston Bolt Torque

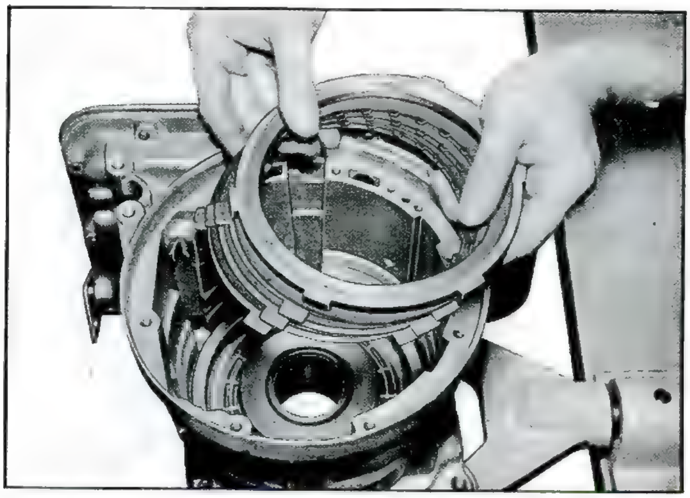


Fig. 7E-51—Installing Reverse Clutch Plates

4. Install the reverse clutch drive and reaction plates (fig. 7E-51) alternately starting with a reaction plate (steel) and finishing with a drive plate (faced). The notched lug in each steel reaction plate is installed so it is at the top of the groove at the 4 o'clock position in the case. Then install the thick reaction plate. It has a square "dimple" on its lug which engages the 4 o'clock case groove.
5. Install reverse clutch plate retainer ring in such a manner so that the open ends of the ring are at the 12 o'clock position (fig. 7E-52).
6. With the rear of the transmission case downward, align the internal lands and grooves of the reverse face plates.
7. Engage the ring gear to the reverse drive plates as illustrated in Figure 7E-53. Engagement must be made by "feel" while jiggling the drive plates laterally.
8. On assemblies being performed with the transmission installed on the Power Train, install the turbine shaft at this point. Be sure to fully engage splines of the turbine shaft to those in converter turbine.

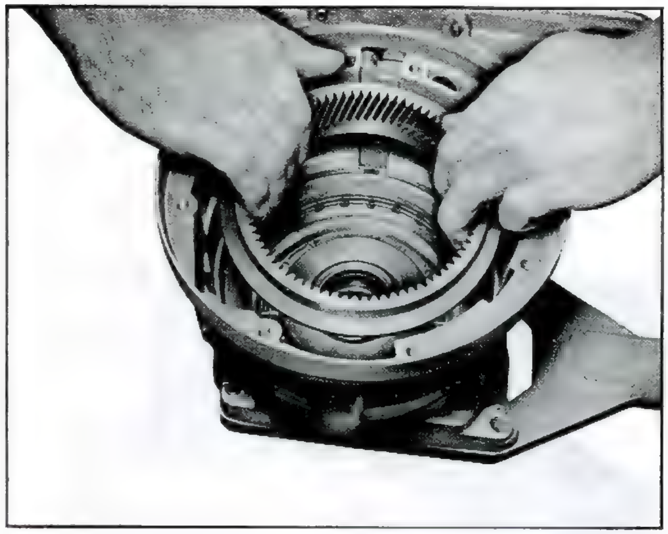


Fig. 7E-53—Installing Ring Gear

9. Install the planetary unit with a slight twist to engage planet gears with ring gear. Be sure to engage the two rear pump drive lugs on planet hub with grooves in rear pump drive gear.
10. Install the clutch drum assembly (fig. 7E-54), using a slight twist to engage the low sun gear to the planet gears in the planetary gear set.
11. If the overhaul is being performed with the transmission mounted in the holding fixture J-7896, turn transmission to a horizontal position, then install the low band, apply strut, and reaction strut (fig. 7E-55). When the low band linkage is all installed, snuggly tighten the low band adjustment screw to prevent struts from falling out of place. Then jiggle the clutch drum slightly to center the band and linkage.

Front Selective Thrust Washer Determination

12. Prior to reinstallation of the front pump when overhauling the "Powerglide" while assembled to the

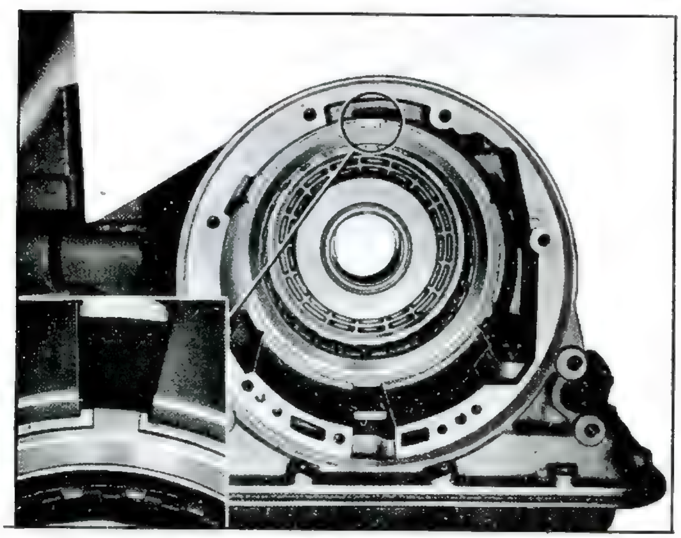


Fig. 7E-52—Reverse Clutch Pack Retaining Ring

Fig. 7E-54—Installing Clutch Drum

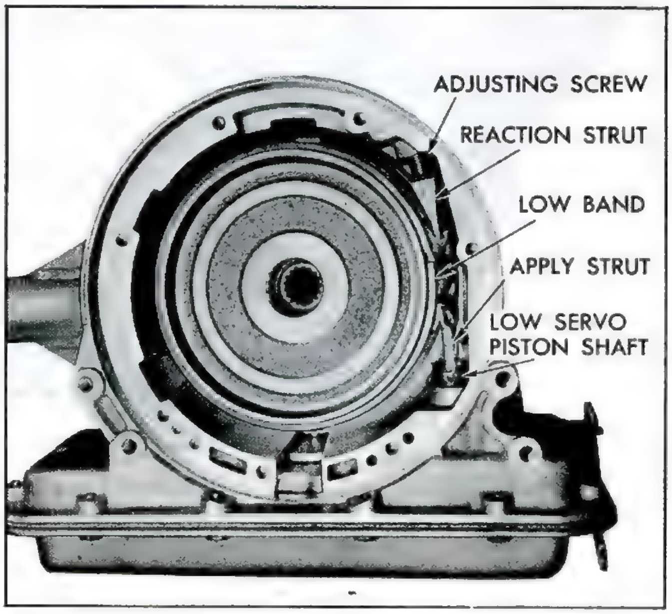


Fig. 7E-55—Low Band Components Installed

differential carrier and engine, determine the front selective thrust washer to be installed with J-8371 as described below.

CAUTION: Use of J-8371 and the following procedure is absolutely limited to overhauls performed while the transmission is assembled to the differential carrier. At this point during overhauls performed with the transmission separated from the differential carrier, install the original (unless necessary to replace) thrust washer on the front pump hub without gauging, and complete transmission assembly. Final end play adjustment would then be made at the rear (governor gear) as described in Section 4 "Rear Axle".

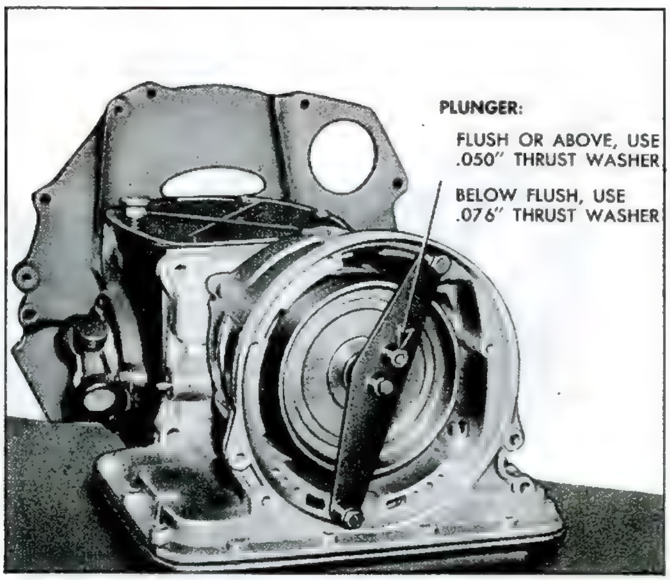


Fig. 7E-56—Gauging Clutch Drum Thrust Washer with J-8371

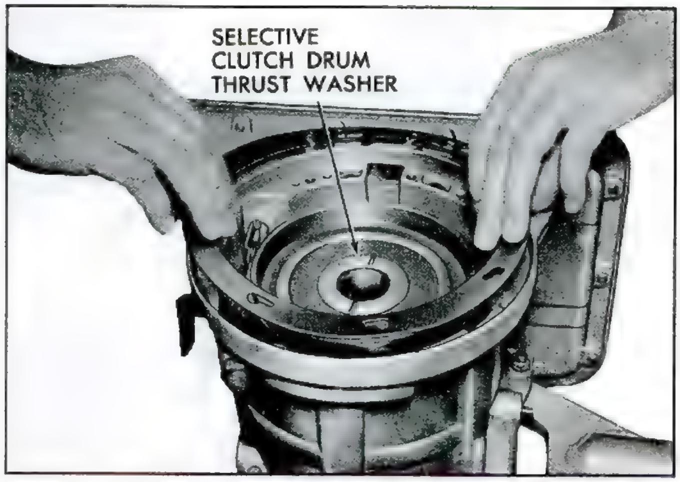


Fig. 7E-57—Installing Front Pump Gasket

a. Insert the pilot of J-8371 into bore of clutch drum and secure J-8371 to case with two front pump mounting bolts (fig. 7E-56). Tighten bolts fully to compress pilot spring.
b. Check that plunger (fig. 7E-56) is fully seated, then observe plunger position:
   If plunger is below flush, .076" thrust washer is required.
   If plunger is flush or above, .050" thrust washer is required.
c. Remove J-8371 and install thrust washer (fig. 7E-57) selected on front pump hub.

13. Install a new front pump gasket (fig. 7E-57), then install the front pump body, being careful not to break cast iron oil ring on pump body hub when they are indexed to the clutch drum.
14. Install front pump drive shaft (fig. 7E-58). Use care when inserting pump shaft not to damage bushings of transmission components already installed.
15. Install a new square cut seal ring in front pump cover (fig. 7E-59), then position front pump cover,

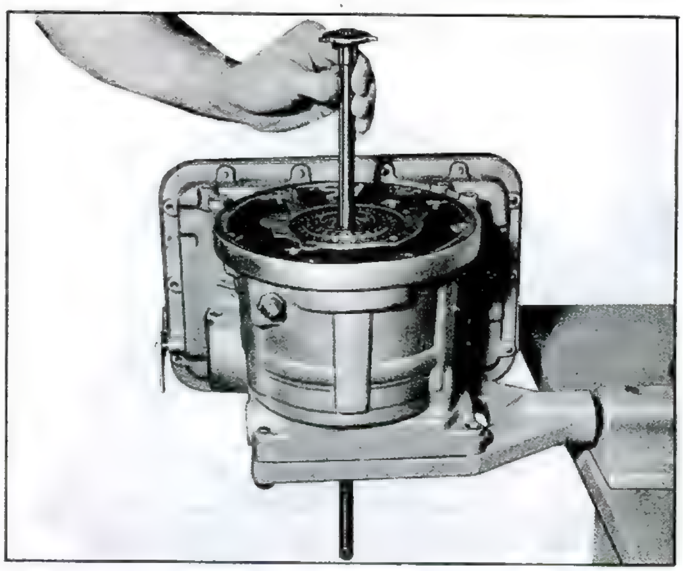


Fig. 7E-58—Installing Front Pump Drive Shaft

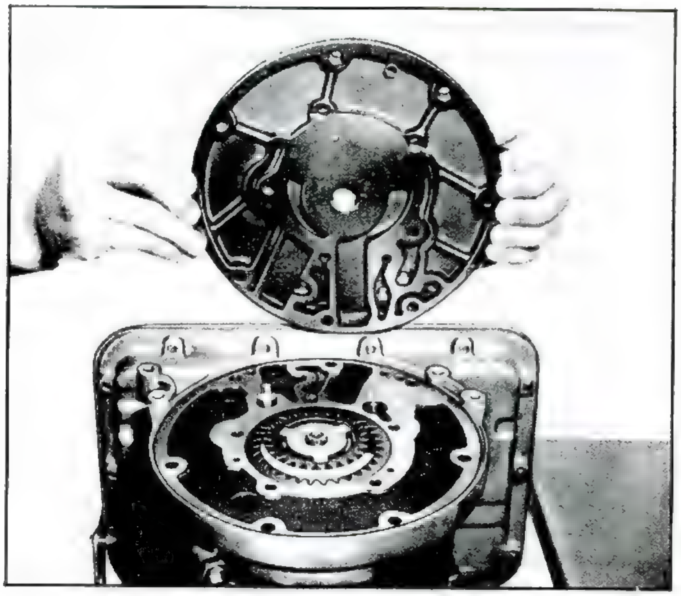


Fig. 7E-59—Installing Front Pump Cover

dip bolt heads in oil impervious sealer such as used on Turboglide front pump bolts and install mounting bolts loosely. Tighten outer bolts in a criss-cross pattern to 15-20 ft. lbs. torque, then tighten five inner bolts to same torque (fig. 7E-61). By using

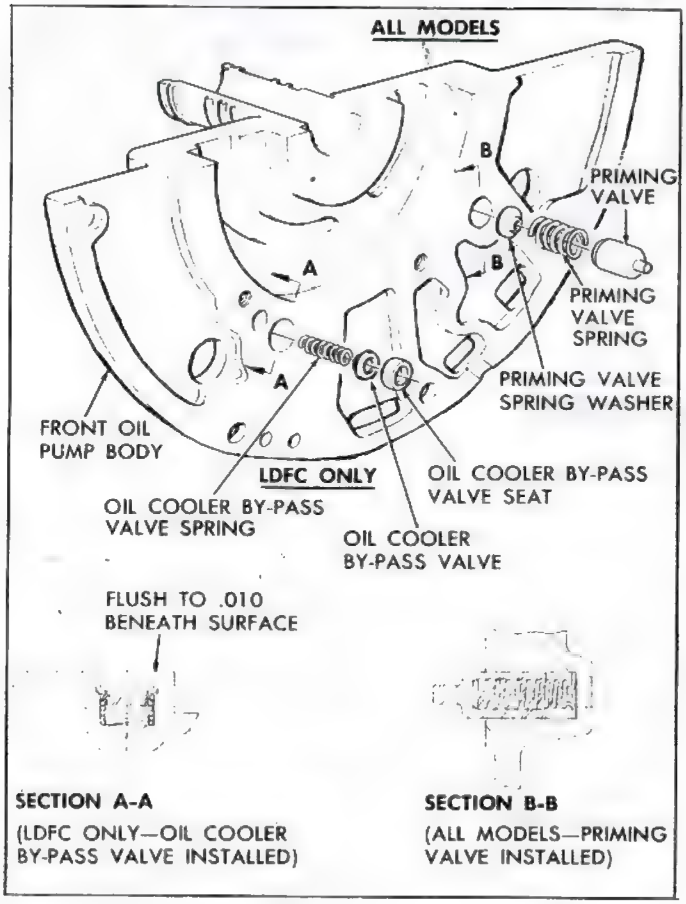


Fig. 7E-60—Front Pump Body and Components

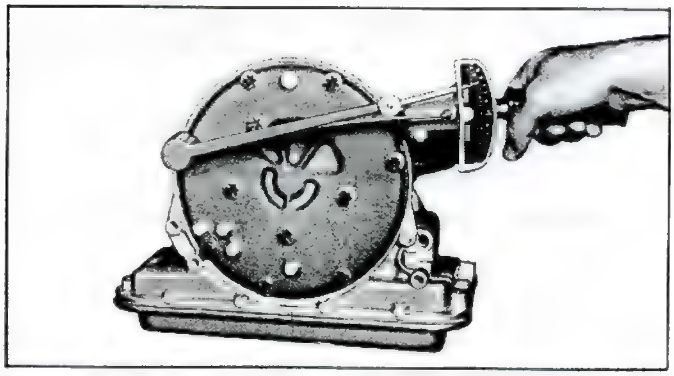


Fig. 7E-61—Measuring Front Pump Bolt Torque

this sequence, the chance of cocking the front pump which would bind the pump hub to the front pump shaft is virtually eliminated.

16. Adjust the low band by first tightening the adjusting screw to 40 ± 5 in. lbs., then back off four (4) full turns exactly. Hold the adjusting screw and lock the adjustment by fully tightening the locknut.

If assembly of transmission has been performed with the transmission separated from the Power Train, it will be necessary to determine the thickness required in selective spacers to be installed at the governor gear location prior to reassembly of the transmission to the differential carrier. This procedure is provided earlier

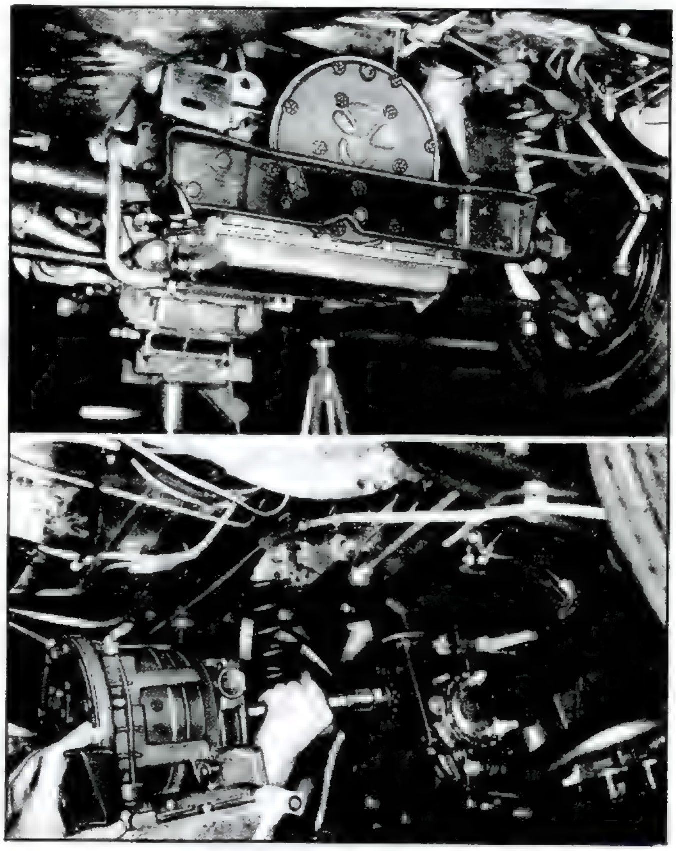


Fig. 7E-62—Removing Powerglide from Vehicle

in this manual in Section 4 "Rear Axle" where the instructions for assembly of the Rear Axle to the Powerglide are provided.

POWERGLIDE TRANSMISSION REMOVAL AND INSTALLATION

1. Disconnect engine seal at front shield; left and right sides.

   NOTE: Disconnect seal from shield by grasping at lower edge and pulling groove of seal off of shield flanges.

2. Disconnect starter motor wires at quick disconnect connector, and one battery cable at battery.
3. If so equipped, disconnect radio ground straps at left and right shields.
4. Raise vehicle and support on jack stands; then remove grille and rear center shield.
5. Place engine lift with Tool J-7894 attached, under engine and support weight of engine.
6. Loosen two engine rear mount nuts until nuts are flush with end of stud.
7. Disconnect fuel line from body clip so that line can spring away from floor pan.
8. Remove two upper retaining bolts from left and right rear strut rod brackets at differential carrier, then loosen two lower retaining bolts at left and right rear strut rod bracket approximately 3 turns.
9. Disconnect accelerator rods at transmission bellcrank.
10. Disconnect left and right front strut rod brackets at engine front mount bracket.
11. Disconnect transmission tube and drain transmission.
12. Disconnect transmission control cable at transmission and disconnect vacuum modulator hose at modulator.
13. Disconnect emergency brake return spring from front mount bracket then disconnect emergency brake cable at equalizer.
14. Remove cotter keys and remove front mount nuts.
15. Remove Powerglide governor.
16. Lower engine enough for transmission to clear lower body on removal. Remove 3 remaining bolts retaining transmission to differential and pull transmission forward far enough to grasp turbine shaft (fig. 7E-62), then grasping turbine shaft remove transmission with turbine shaft and front pump drive shaft in place.

    NOTE: Transmission is removed with engine front bracket attached to transmission.

17. For installation of transmission, reverse removal procedures.

    NOTE: When installing the turbine shaft be careful not to damage its bushings as it is inserted over the front pump drive shaft splines. Be sure to engage the two sets of splines. When installing transmission to axle, align the two units and carefully guide the turbine and front pump drive shafts thru the differential carrier so as not to damage the bushing in the pinion. Engage the splines of the pinion shaft with the planet carrier internal splines. Be sure to get full engagement of the splines on the stator shaft, turbine shaft and front pump drive shaft with the applicable converter splines by rotating transmission and/or slowly turning rear wheels or axle shafts.

18. Install engine seal to shields by lubricating groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange with one hand, press seal in place with a block of wood or hammer handle.
19. Refill transmission with lubricant specified in Section 0.
20. Check shift linkage operation and adjust if necessary as outlined under "Shift Linkage Adjustment" in this Section.
21. Check operation of parking brake and accelerator controls, adjusting if necessary as outlined in Sections 5 and 6 respectively.

DIAGNOSIS GUIDE

HYDRAULIC PRESSURE DATA

Pressure Tap Locations

Two pressure tap plugs in the front pump cover are accessible via holes in the engine front mount; front pump pressure is at the 6 o'clock position and throttle valve (TV) pressure is at the 8 o'clock position.

Test Preparation

All tests can be made without driving the vehicle by simply raising the wheels 3-5 inches from the floor on stand jacks. With pressure gauges installed, perform the following preliminary steps:

- Establish pressure gauges indicator needle rest positions at zero pressure
- Thoroughly warm-up transmission
- Check transmission oil level
- Check linkage adjustment

FRONT PUMP PRESSURS (PSI)				
	Range Selector Position			
Condition	R	N	D	L
At idle (16" Hg)	104-122	52-64	52-64	94-105
At idle, with vacuum hose disconnected at balance tube	184-200	94-105	94-105	94-105

NOTE: Front pump pressures as measured on the front pump pressure gauge are actual pump pressures, not mainline pressures, and must be obtained with the engine speed at idle (16" Hg).

Absence of front pump pressures results in no drive in any range as this pressure is required to apply the applicable clutch for a given range. Common causes would be stuck pressure regulator valve, broken or disengaged front pump shaft, or missing plug from front end of front pump shaft which would divert converter "in."

Moderately low front pump pressures in all ranges would indicate a restricted front pump "in."

Failure of pressure to rise when disconnecting the vacuum hose (or high pressures with the hose connected) would indicate a stuck vacuum modulator valve, defective vacuum modulator, or collapsed hose.

Rear Pump Check

With the rear wheels raised, place the selector in "D" and accelerate the engine. Front pump pressure should drop to approximately 0-5 psi at approximately 20 MPH. If pressure does not drop, rear pump is disengaged or clogged, or rear pump check ball not seating.

THROTTLE VALVE (TV) PRESSURES (PSI)				
Condition	R	N	D	L
Disconnect TV rod at carburetor and vacuum hose at balance tube. Depress accelerator to W.O.T.*	0	0	45-47	94-105

*By disconnecting TV rod at carburetor, engine remains at idle speed throughout test.

Throttle valve pressure tests are of value in cases where the transmission shift points are not in accordance with the "Shift Point—MPH Chart." If pressures are not as prescribed, they may be raised or lowered by adjusting the position of the jam nut on the throttle valve assembly (fig. 7E-11). To raise TV pressure 3 psi, back-off the jam nut one (1) full turn. This increases the dimension from the jam nut to the throttle valve assembly stop. Conversely, tightening the jam nut one (1) full turn lowers TV pressure 3 psi. Smaller pressure adjustments can be made by partial turns of the jam nut. The end of TV adjusting screw has an Allen head so the screw may be held stationary while the jam nut is moved.

CORVAIR POWERGLIDE SHIFT POINT—MPH CHART

Axle	3.27	3.55
Upshifts	MPH	
Minimum Throttle	14-16	12-15
Full Throttle	46-52	42-48
Part Throttle (Detent Touch)	35-44	33-40
Downshifts		
Closed Throttle	12-15	11-14
Full Throttle	42-48	38-44
Part Throttle (Detent Touch)	24-33	22-30
Manual Low (Inhibited)	56-61	52-57

SPECIAL TOOLS

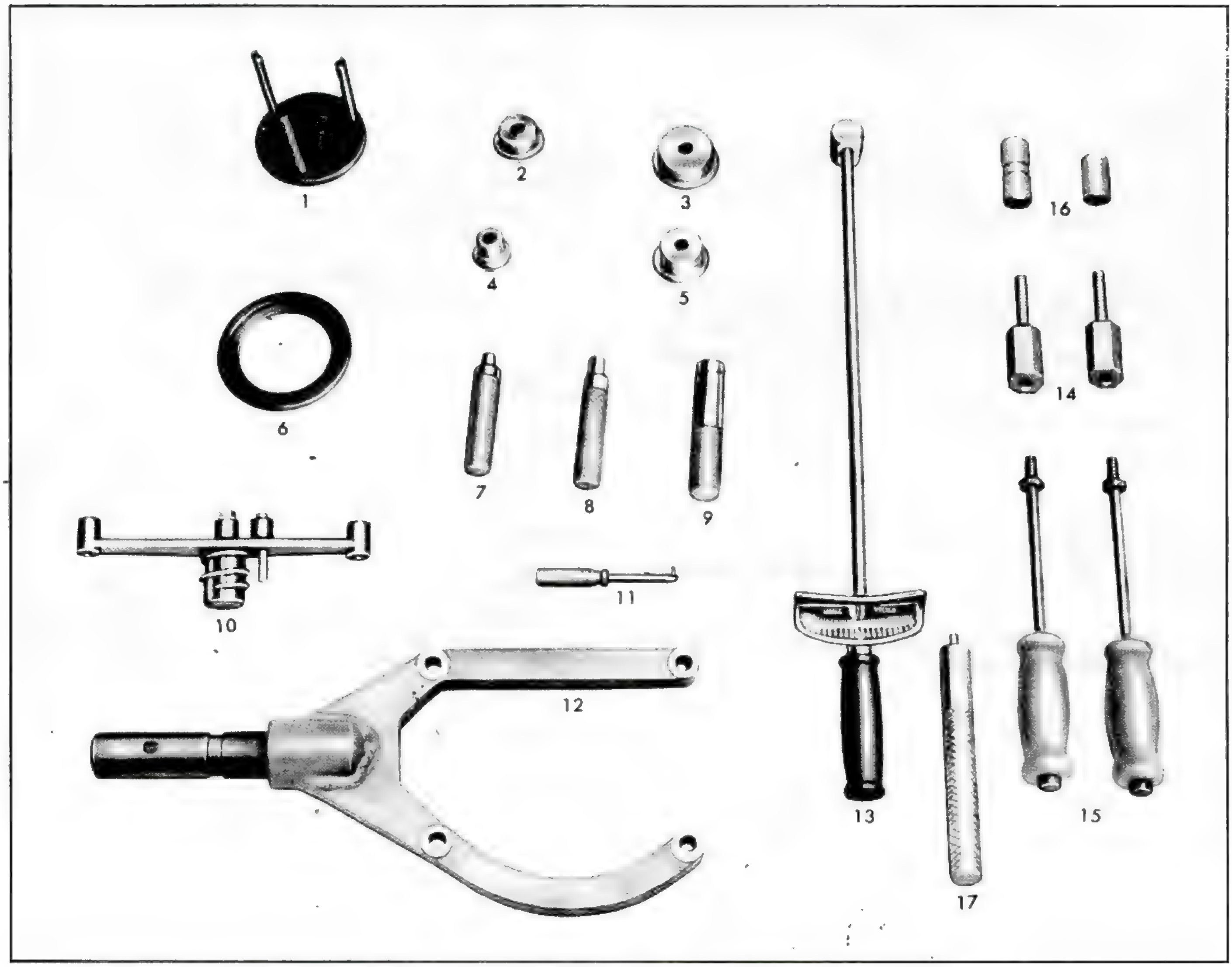


Fig. 7E-63—"Corvair" Powerglide Special Tools

1. J-5133 Clutch Spring Compressor
2. J-8360-2 Clutch Drum Bushing Installer
3. J-8360-4 Rear Pump Body Bushing Installer
4. J-8360-3 Low Sun Gear Bushing Installer
5. J-8360-1 Converter Hub Bushing Installer
6. J-7782 Piston Spring Compressor
7. J-8360-7 Turbine Shaft Rear Bushing Installer
8. J-8360-5 Front Pump Body Bushing Installer
9. J-8360-6 Turbine Shaft Front Bushing Installer
10. J-8371 Front Thrust Washer Selector Gauge
11. J-8365 Manual Valve Lever Gauge
12. J-7896 Transmission Holding Fixture
13. J-1264 0-200 Ft-Lbs Torque Wrench
14. J-6585-3 Front Pump Slide Hammer Adapters
15. J-6585 Slide Hammers
16. J-9560 Pinion Loading Tools
17. J-7079-2 Installer Handle

SECTION 8
FUEL TANK AND EXHAUST SYSTEMS

CONTENTS OF THIS SECTION

FUEL TANKS

INDEX

GENERAL DESCRIPTION
CORVAIR 10000 SERIES VEHICLES

FUEL TANK (Fig. 2)

The Corvair passenger car, 10000 series vehicles, is equipped with a 14 gallon capacity fuel tank. The tank is located at the rear of the front crossmember, in front of the toe pan. The tank is secured in place with a single metal strap attached to the underbody at each end by an adjustable hook. The tank has no drain plug, however, the tank gauge sending unit may be removed for draining of the tank.

CAUTION: When installing toe pan cover screws, caution should be exercised to avoid puncturing the fuel tank.

The filler neck is accessible through a spring loaded door in the left front fender.

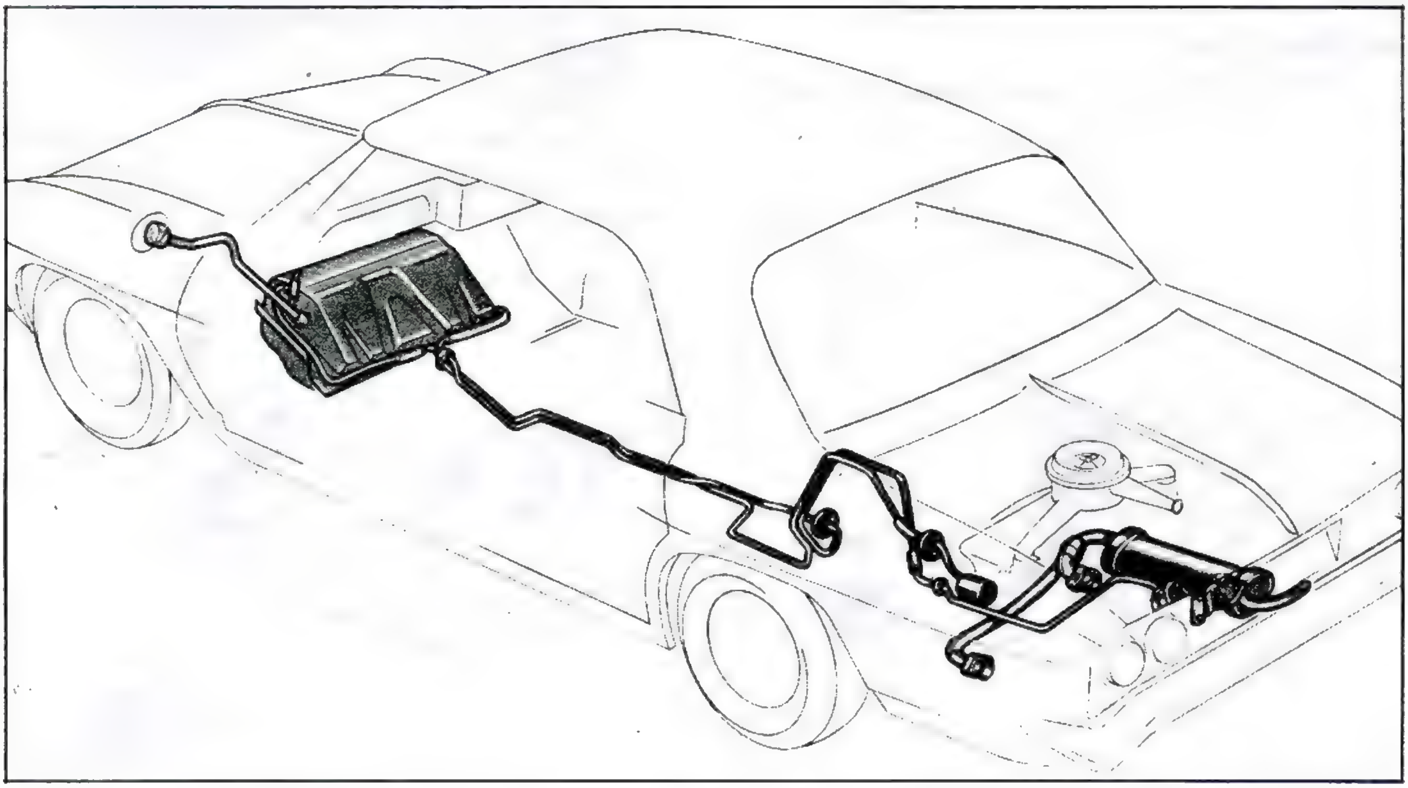


Fig. 1—Fuel Tank and Exhaust System

GAUGE METERING (SENDING) UNIT (Fig. 3)

The fuel pickup is integral with the tank gauge sending unit located at the lower right rear of the tank. A large area, fine mesh screen is located at the end of the fuel pickup pipe to prevent the entrance of dirt or water into the system.

COMPONENT PART REPLACEMENT

FUEL TANKS

Passenger Tanks (10000 Series)

Removal and Installation

1. Remove rubber seal from filler neck just within the access door on the left front fender.
2. Lift vehicle.
3. Drop the stabilizer bar.
4. Drain the tank by removing the tank metering unit (below).
5. Remove the support strap nut attachments.
6. Lift up on the left side of the tank and carefully work the tank down and spring out of its cavity, freeing the right hand side first.
7. Replace the tank in reverse order.

NOTE: Position attachments as indicated by Figure 3.

NOTE: Before replacing tank, check the hose clamp connections between the tank and the filler neck and breather tube. These connections must be properly made before the tank is installed.

TURBO—CHARGED VEHICLES

The turbo-charged vehicles use the same fuel tank and lines as other sedan models plus a fuel by-pass line back to the tank from a metered orifice on the fuel filter. Figure 4 shows this line routing and connections.

DRAINING TANK

The absence of a drain plug in the gas tank makes it necessary to siphon fuel from the tank when draining is needed. The following procedure is recommended.

1. Obtain approximately 10 feet of 3/8" I.D. hose and cut a flap-type slit 18" from one end. Make this cut on the hose in the direction toward the shorter end (See Figure 5).
2. Insert a small pipe nipple (slightly larger O.D. than the hose I.D.) into the opposite end of the hose.
3. Insert the nipple end of the siphon hose into the fuel tank filler neck with the natural curl of the hose pointing down. Insert until the hose is heard to strike bottom of the tank.
4. With the opposite end of the hose in a suitable container, insert an air hose in the flap-type slit and trigger the flow of fuel.

CAUTION: Always drain gasoline from complete fuel system including carburetor, fuel pump and all fuel lines and fuel tank if the vehicle is to be stored for any appreciable length of time. This precaution will prevent accumulation of gum formation and resultant poor engine performance.

FUEL LINES (Fig. 6)

CAUTION: Always drain gasoline from entire fuel system including carburetor, fuel pump, fuel lines and fuel tank if car is to be stored for any appreciable length of time. This precaution will prevent gum formation and resultant improper engine performance.

The fuel lines should be inspected occasionally for leaks, kinks or dents. If evidence of dirt is found in the carburetor or fuel pump on disassembly, the lines should be disconnected and blown out.

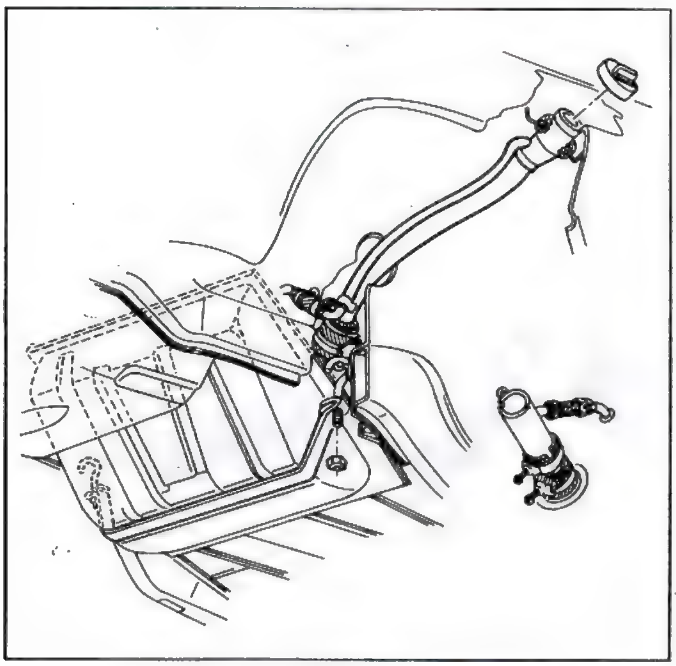


Fig. 2—Fuel Tank (10000 Series)

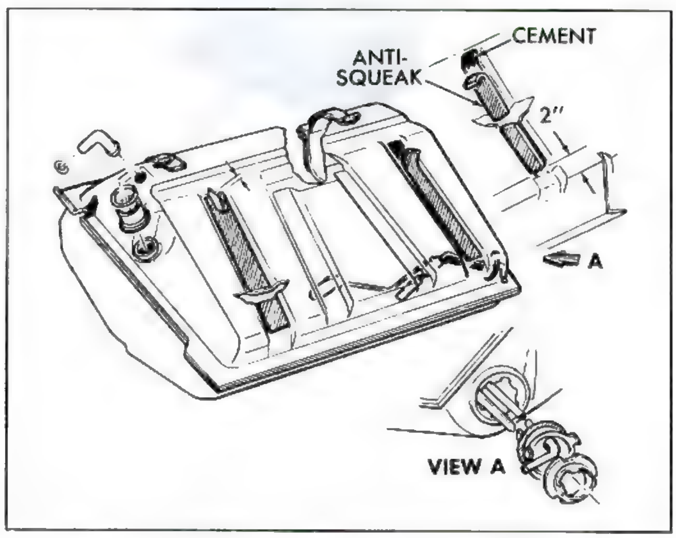


Fig. 3—Fuel Tank and Metering Unit

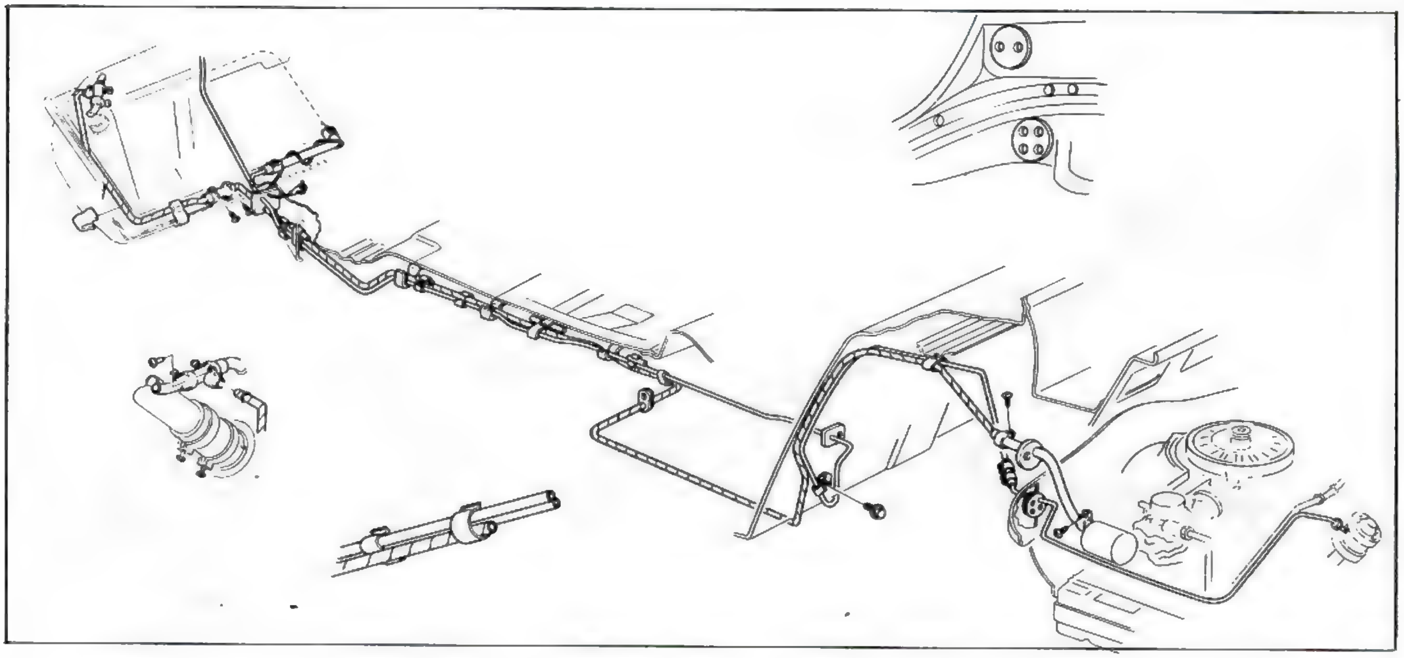


Fig. 4—Fuel Tank Lines (also by-pass for turbo-charged shown)

The fuel line (fig. 6) extends from a hose clamp connection at the tank gauge sending unit, through underbody area another hose clamp connection, where it meets the fuel line to the fuel pump at a point just ahead of the front engine shield assembly.

Passenger Cars (10000 Series)

Removal

1. Remove the underbody front and rear shields (see Section 11).
2. Disconnect the hose clamp connections at the front and rear ends of the fuel line.

   NOTE: Plug fuel pickup to eliminate draining tank.

3. Remove the line from the five clips attaching the lines to the underbody in the rear pickup area and use a screw driver to remove two clips in the underbody tunnel area.

   NOTE: To release the clips, place the blade of the screw driver between the two hanging tabs and twist the screw driver to release the locking fingers.

4. Remove fuel lines.

Installation

1. Replace grommets on lines if removed.
2. Hold fuel lines in place and replace clips.

   NOTE: Use new clips when replacing within the tunnel area. Attach by inserting the point of the clip into the hole in the underbody and then squeezing the locking fingers with a suitable pliers.

3. Make all front and rear fuel line connections.
4. Replace tunnel cover (See Section 11).

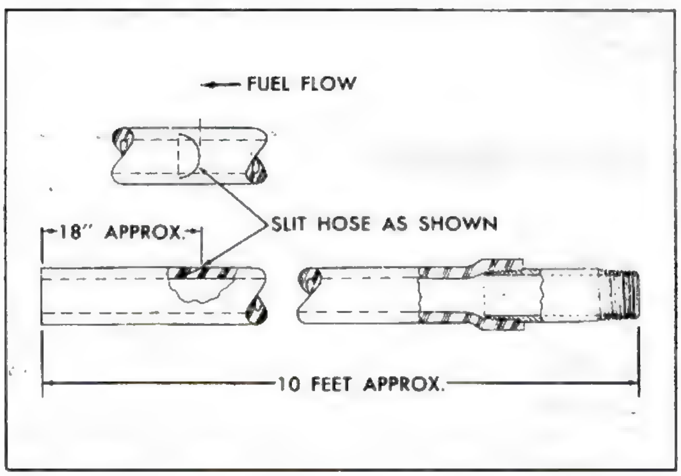


Fig. 5—Siphon Construction

GAUGE METERING UNIT AND FUEL STRAINER

Passenger Cars (See Fig. 3)

Replacement

1. Disconnect gauge wire plug and ground wire.
2. Drain gasoline from tank by using Tool J-8950 (modified) to turn tank gauge unit cam counterclockwise.
3. Remove tank gauge unit.
4. Clean strainer by blowing off with compressed air or replace the strainer if damaged.
5. Reverse the above procedure to install a gauge unit. Before plugging in the gauge wire, the spanner nut in the plug receptacle should be checked for tightness.

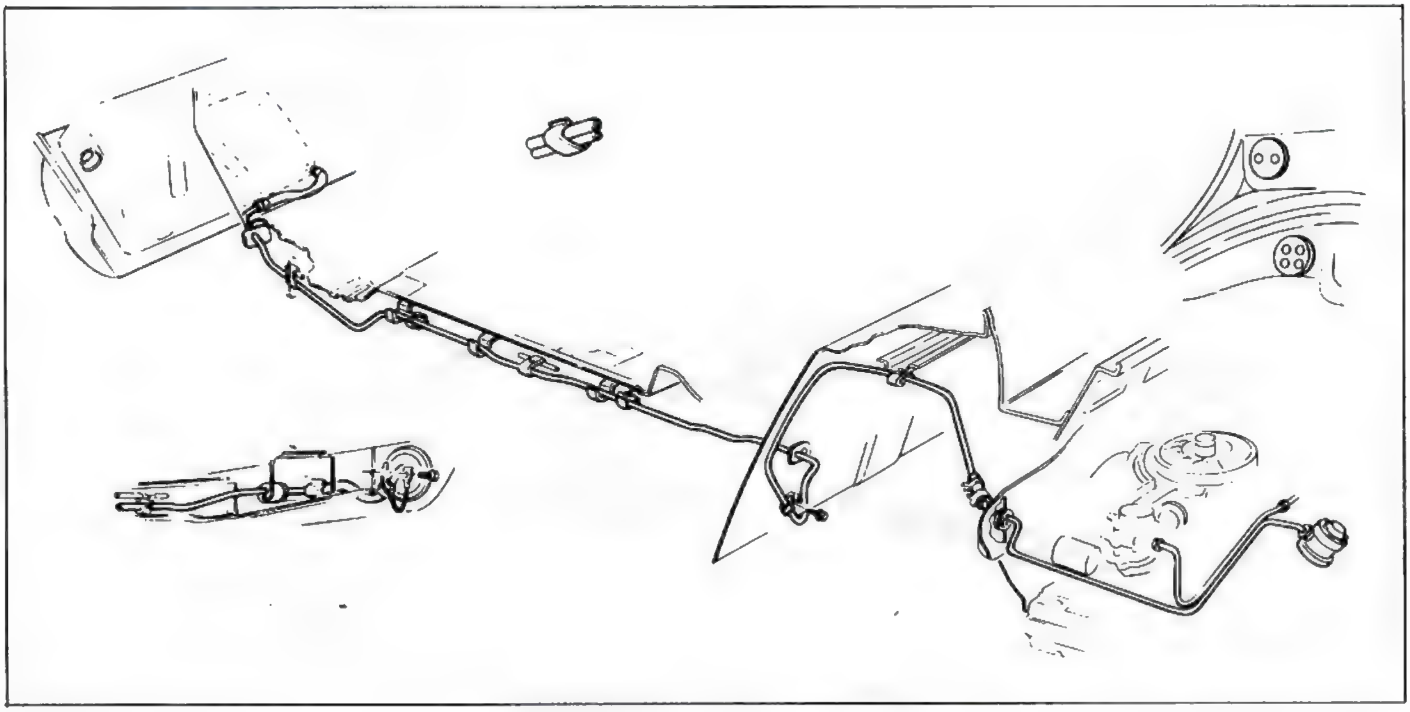


Fig. 6—Fuel Lines--Corvair (10000 Series)

EXHAUST SYSTEMS

INDEX

GENERAL DESCRIPTION

The new 1965 Corvair features a new muffler with a longer tail pipe to suit new body design with improved tuning. The new exhaust pipe conforms to the new rear body engine sealing and body rail design. The muffler is secured to the engine side shield assembly with a bracket and strap.

COMPONENT PART REPLACEMENT

MUFFLER AND EXHAUST PIPE

Removal

1. Remove both manifold to exhaust pipe nuts, remove packing and separate.
2. Remove the screw securing the muffler strap to the mounting bracket (attached to engine side shield).

Installation

1. Replace muffler and exhaust pipe in same order as removed.
2. Clearances are critical to prevent heat transfer, refer to Figure 8.

TAIL PIPE

Replacement

The tail pipe can be replaced with a new pipe and attachments without replacement of the muffler. The same rear quarter panel and muffler clearances should be followed.

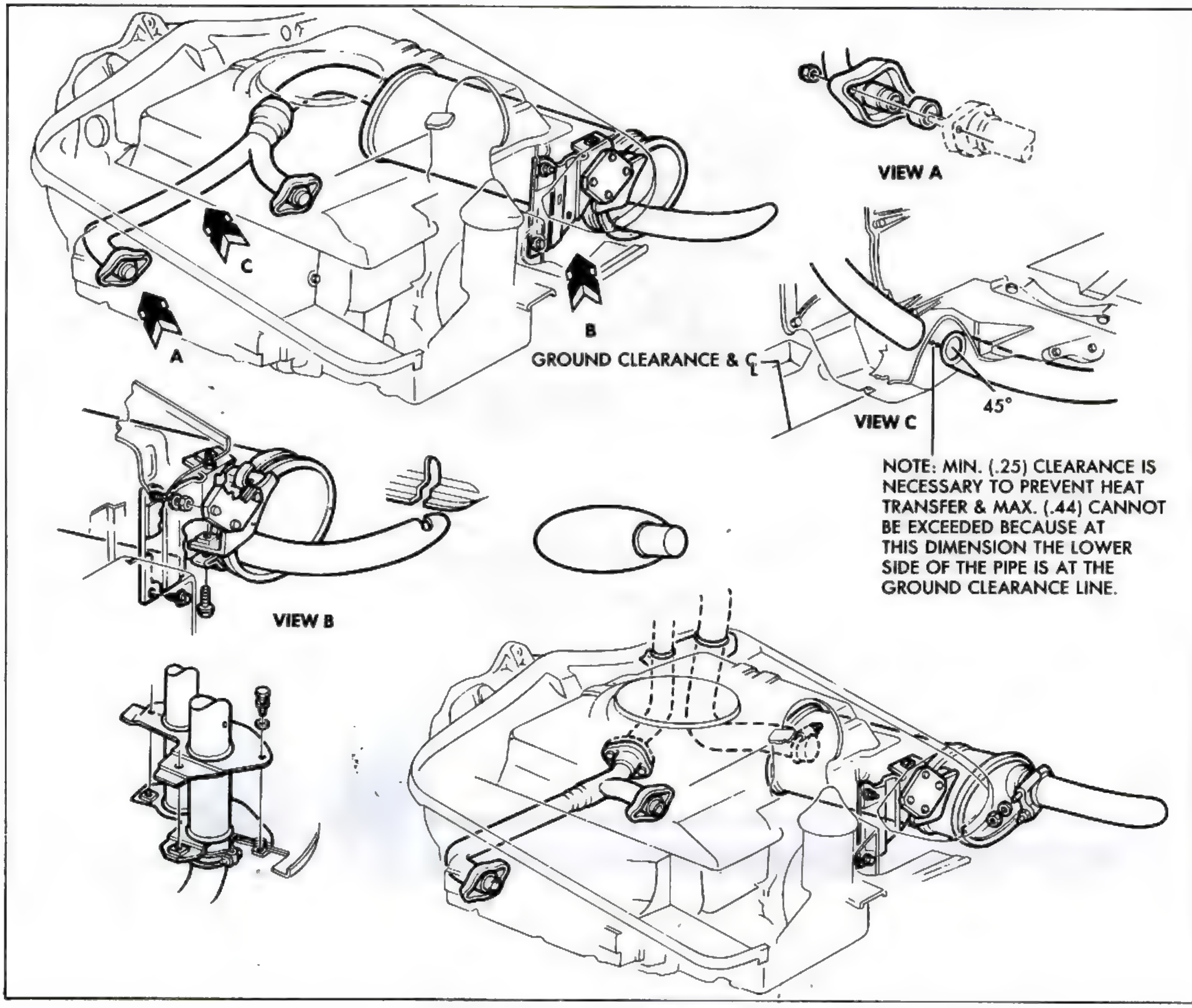


Fig. 7—Corvair Exhaust System

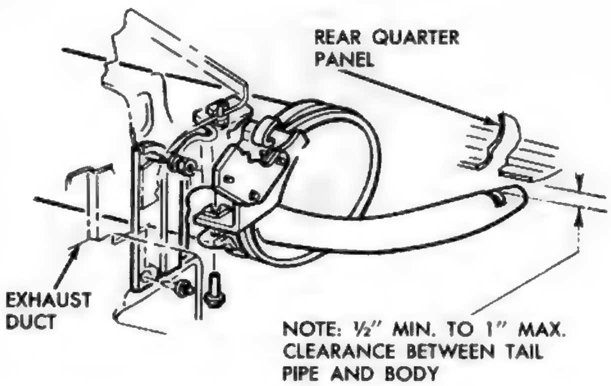


Fig. 8—Muffler and Bracket Attachment

SPECIAL TOOLS

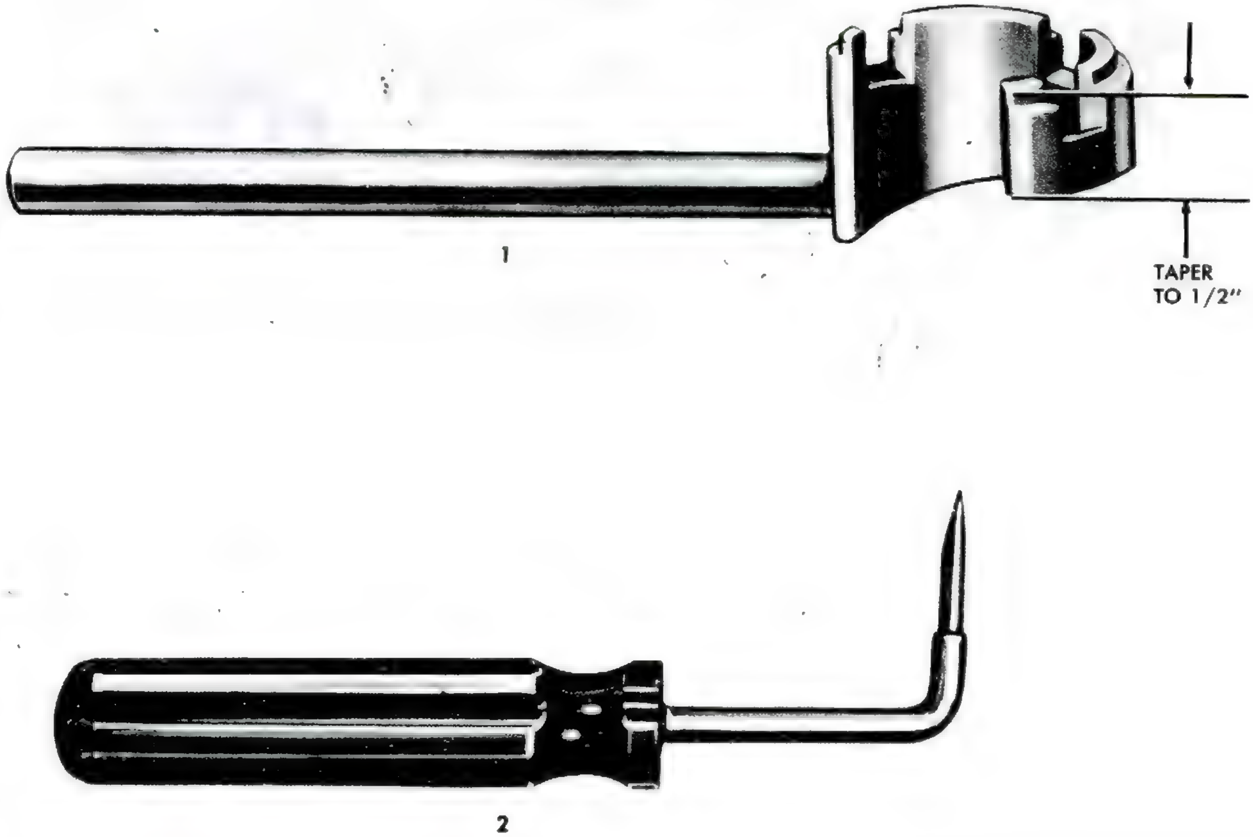


Fig. 9—Special Tools

1. J-8950 Fuel Tank Gauge Unit Spanner
2. J-7777 Fuel Line Clip Installer

SECTION 9
STEERING

CONTENTS OF THIS SECTION

CORVAIR 10,000 SERIES

INDEX

GENERAL DESCRIPTION

The regular production steering gear (fig. 1) is the recirculating ball type.

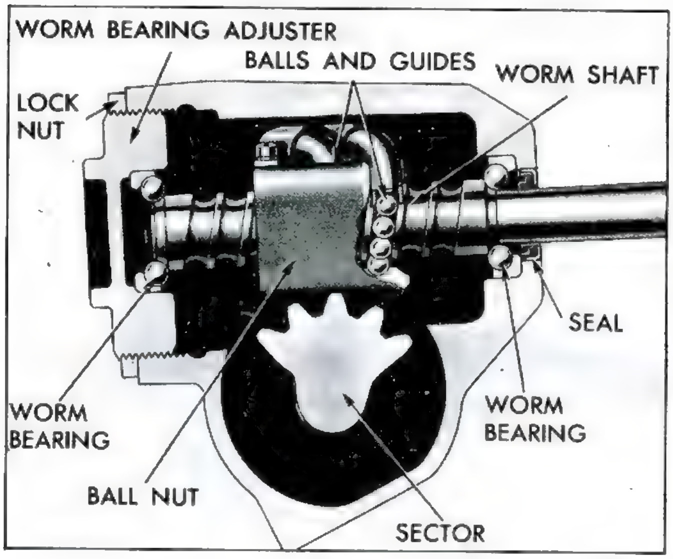


Fig. 1—Steering Gear Worm and Ball Nut Circuits

This gear provides for ease of handling by having forces transmitted from worm to sector gear through ball bearings. The steering linkage (fig. 2) is of the relay type, and extended interval lubrication design, with the pitman arm connected to a relay rod by means of a self-adjusting ball and stud joint. The relay rod is connected to an idler arm which in turn, is connected to a support bolted to the frame side rail opposite the steering gear.

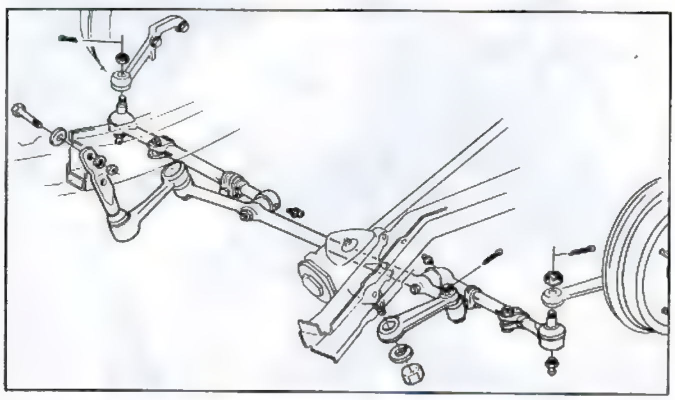


Fig. 2—Steering Linkage

Pivoting at the relay rod end of the idler arm is accomplished in rubber insulated nylon bushings. Connecting the relay rod to the steering arms are two adjustable tie rods with self-adjusting ball and socket type joints.

The hole for lubrication fittings in the replacement tie rod sockets, front suspension ball studs, steering connecting rods and various other parts will not be threaded. This will make it necessary to use the new self-threading lubrication fittings where applicable.

MAINTENANCE AND ADJUSTMENTS

LUBRICATION

The steering gear is filled at the factory with a special all-season gear lubricant. Seasonal change is unnecessary and the housing should not be drained. Lubricant level should be checked every 36,000 miles. When required, add water resistant E.P. lubricant. Refer to Lubrication, Section 2, for lube points and intervals.

ADJUSTMENTS

Steering Gear

Before attempting steering gear adjustments in an attempt to correct such conditions as shimmy, loose or hard steering, or road shocks, make a careful check of front end alignment, shock absorbers, wheel balance and tire pressure for possible causes.

Correct adjustment of the steering gear is very important. Only two adjustments are possible but they must be made in the following manner, step by step, in the order given. The lash adjusting screw is accessible through the trunk compartment floor pan plug.

1. Remove pitman arm nut and lock washer and, using Tool J-6627, pull pitman arm from pitman shaft (fig. 3).
2. Loosen pitman shaft lash adjuster screw locknut (fig. 4) and turn the lash adjuster screw a few turns counter-clockwise to remove overcenter load (increase lash). Gently turn the wheel in one direction until stopped by gear and then back off one turn of the steering wheel.

CAUTION: Do not turn the wheel hard against the stops when the pitman arm is disconnected since this may damage the ball guides.

3. Pry off the horn button. Using a suitable size socket and a low reading (in. lbs.) torque wrench on the steering shaft nut, measure the torque needed to keep the wheel in motion. This should be between 3-1/2 and 4-1/2 in. lbs. If the torque does not fall within these limits, adjustment of the worm bearing is necessary.
4. To adjust the worm bearings (See Figure 1): loosen the worm bearing adjuster locknut and turn worm bearing adjuster down until there is no perceptible end play in worm. Check the pull at the torque wrench, readjusting the adjuster nut as necessary to obtain proper pull. Tighten the locknut and recheck pull. If the gear feels "lumpy" after worm bearing adjustment, the bearings are probably damaged and the gear should be removed and disassembled for replacement of the damaged parts. See "Service Operations".
5. After proper worm adjustment is obtained, and all mounting bolts are securely tightened, adjust the lash adjuster screw (fig. 4). First turn the steering wheel gently from one stop all the way to the other, counting the total number of turns. Then turn the wheel back exactly half way to the center position. The mark on the steering shaft should be at the 12 o'clock position. Turn the lash adjuster screw clockwise to take out all lash in the gear teeth, then tighten the locknut. Check the highest torque needed to turn the wheel through the center position (fig. 5). Torque should be between 8 and 10 in. lbs. in excess

Fig. 3—Removing Pitman Arm With Tool J-6627

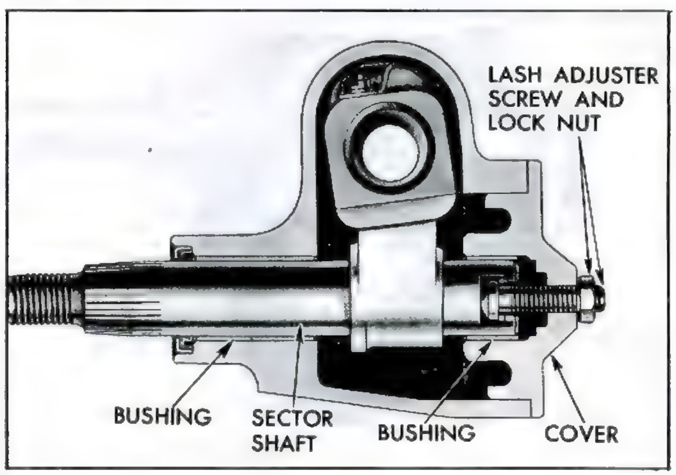


Fig. 4—Sector Gear and Pitman Shaft

of worm bearing preload, but not more than a total of 14 in. lbs. Readjust if necessary to obtain proper pull.

6. Tighten locknut and recheck. Torque must lie between the specified limits.

   NOTE: Always make the final lash adjustment in the clockwise direction.

7. Reassemble pitman arm to pitman shaft, first making sure that wheels are straight ahead and that the steering wheel and gear are centered.

Steering Wheel Alignment and High Point Centering

1. Set front wheels in straight ahead position. This can be checked by driving vehicle a short distance to determine steering wheel position at which vehicle follows a straight path.
2. With front wheels set straight ahead and horn button removed, check position of mark on the wormshaft designating steering gear high point, should be at the top side of the shaft at 12 o'clock position.

   Remove steering wheel, if necessary, and align wheel with mark on bottom of steering shaft (wheel should be set in straight ahead position).
3. If gear has been moved off high point when setting wheels in straight ahead position, loosen adjusting sleeve clamps on both left and right hand tie rods, then turn each sleeve an equal amount in the same direction to bring gear back on high point.

   CAUTION: Turning the sleeves an unequal number of turns or in different directions will disturb the toe-in setting of the wheels.
4. Tighten all sleeve clamp bolts and torque to specifications.

   CAUTION: Tie rod clamp bosses must be pointing down and the bolt parallel with the ground.

Steering Shaft and Mast Jacket Relationship and Alignment

The proper relationship between mast jacket, steering

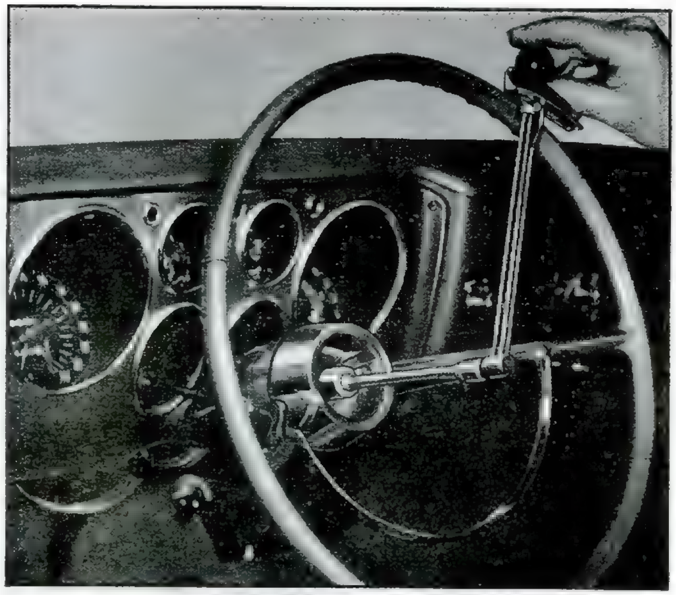


Fig. 5—Checking Steering Gear Turning Torque

shaft and steering gear is determined by the location of the mast jacket and the steering gear.

The steering shaft is centered in the upper mast jacket by a bearing.

Adjustment is secured by shifting the lower end of the mast jacket so that the jacket runs concentric to the steering shaft. Oversize bolt holes are provided for this purpose. The mast jacket should be positioned axially to obtain .080" clearance between the steering wheel and directional housing. When adjustment is completed, tighten all mast jacket attaching bolts.

Toe-In Adjustment

A procedure for adjusting the steering linkage for proper toe-in setting is described in Section 3.

SERVICE OPERATIONS

STEERING GEAR (REGULAR PRODUCTION)

Removal

1. Disconnect directional signal switch harness from chassis wiring harness at connector.
2. Pull out horn button on standard series models. On remaining models pull out center ornament from horn ring.
3. Remove three screws from the receiving cup or horn ring.
4. Remove the receiving cup or horn ring, belleville spring, bushing and on deluxe wheel the pivot ring.
5. Remove steering wheel nut and washer from steering shaft.
6. Use Tool J-2927 and J-2927-6 to remove steering wheel (fig. 6).

   NOTE: Do not lose the sleeve and spring located on the shaft under the steering wheel.
7. Direction signal canceling cam may be removed if desired.

Installation

1. Replace all components in the order removed. Make sure that the mark on the steering shaft lines up with the mark on the steering wheel. Torque wheel nut 35-40 ft. lbs.

STEERING WHEEL (SIMULATED WOOD Fig. 7)

Removal

1. Disconnect horn wire at chassis wiring harness.
2. Remove horn cap by pulling up.
3. Remove three contact assembly attaching screws and remove contact assembly.
4. Remove steering wheel attaching nut and washer.
5. Using Tool J-2927 install centering adapter (J-2927-6) on steering shaft, thread puller anchor screws (4" long) into threaded holes provided in hub assembly. Turn center bolt of tool clockwise to remove hub assembly.
6. The steering wheel may be separated from the hub assembly at this time if necessary by removing the six attaching rivets.

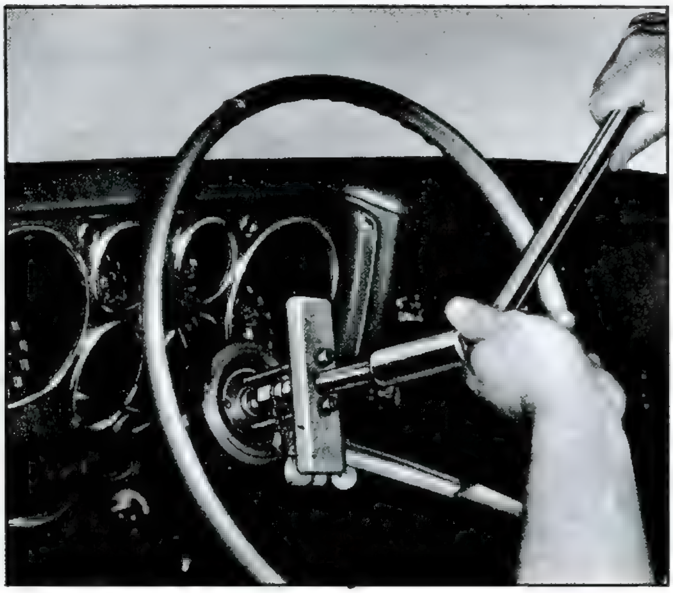


Fig. 6—Steering Wheel Removal

Installation

1. If the steering wheel and hub assembly were separated, replace the original rivets with special flat head attaching screws, nuts and lock washers.
2. Replace all components in the reverse order of removal.

   NOTE: Align mark on steering wheel hub assembly with mark on steering shaft when assembling.

STEERING GEAR (REGULAR PRODUCTION)

Removal

1. Remove steering wheel as previously outlined.
2. Raise front end of vehicle and remove pitman arm from pitman shaft using Tool J-6627.
3. Remove the three mounting bolts from the steering gear while supporting gear.
4. Remove steering gear and shaft from the bottom of the vehicle.

STEERING GEAR (W/TELESCOPING MAST JACKET)

Removal

1. Raise front of vehicle and drill a 2" diameter hole in the left front wheel splash shield (fig. 18).
2. Remove the upper steering coupling bolt and nut.
3. Remove the pitman arm from the pitman shaft using Tool J-6627.
4. Remove the three mounting bolts from the steering gear while supporting the gear.
5. Remove steering gear from the bottom of the vehicle.

Disassembly

All steering gear parts must be kept clean and free from dirt. Spread clean paper or rags on the bench before starting disassembly of the steering gear. Figure 8 shows a disassembled view of the gear.

1. Loosen locknut on end of pitman shaft and turn the lash adjuster a few turns counter-clockwise. This will remove the load from the worm bearings caused by the close meshing of the rack and sector teeth.
2. Loosen the locknut on the worm bearing adjuster and turn the adjuster counter-clockwise a few turns.
3. Place a pan under the assembly to catch the lubricant and remove the three bolts and washers attaching side cover to housing.
4. Pull the side cover, with the pitman shaft, from the housing (fig. 9).

   NOTE: If the sector does not clear the opening in the housing easily, turn the wormshaft by hand until the sector will pass through the opening in in the housing.

5. Remove the worm bearing adjuster, adjuster locknut and lower ball bearing from housing.
6. Draw wormshaft and nut assembly from housing (fig. 10). Remove upper ball bearing.

   CAUTION: Use care that the ball nut does not run down to either end of the worm. Damage will be done to the ends of the ball guides if the nut is allowed to rotate until stopped at the end of the worm.

7. Remove locknut from lash adjuster and unscrew adjuster from side cover by turning adjuster clockwise. Slide adjuster and shim out of slot in end of pitman shaft.

Ball Nut Disassembly

As a rule, disassembly of the ball bearing nut will not be necessary if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

1. Remove screws and clamp retaining ball guides in nut. Draw guide out of nut.
2. Turn the nut upside down and rotate the wormshaft back and forth until all 48 balls have dropped out of the nut into a clean pan. With the balls removed, the nut can be pulled endwise off the worm.

Inspection

With the steering gear completely disassembled, wash all parts in cleaning solvent. Dry them thoroughly with clean rags. With a magnifying glass inspect the ball bearings, bearing cups, worm and nut grooves and the surface of all balls for signs of indentation. Also check for any signs of chipping or breakdown of the surface.

Any parts that show signs of damage should be replaced. Balls must be replaced with genuine Chevrolet parts made according to specifications for this steering gear.

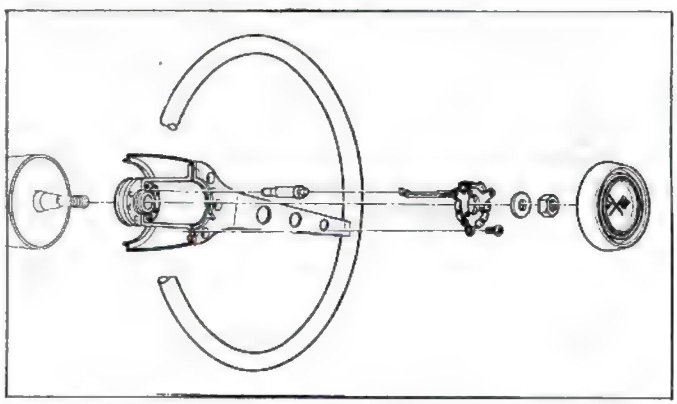


Fig. 7—Simulated Wood Steering Wheel and Attaching Parts

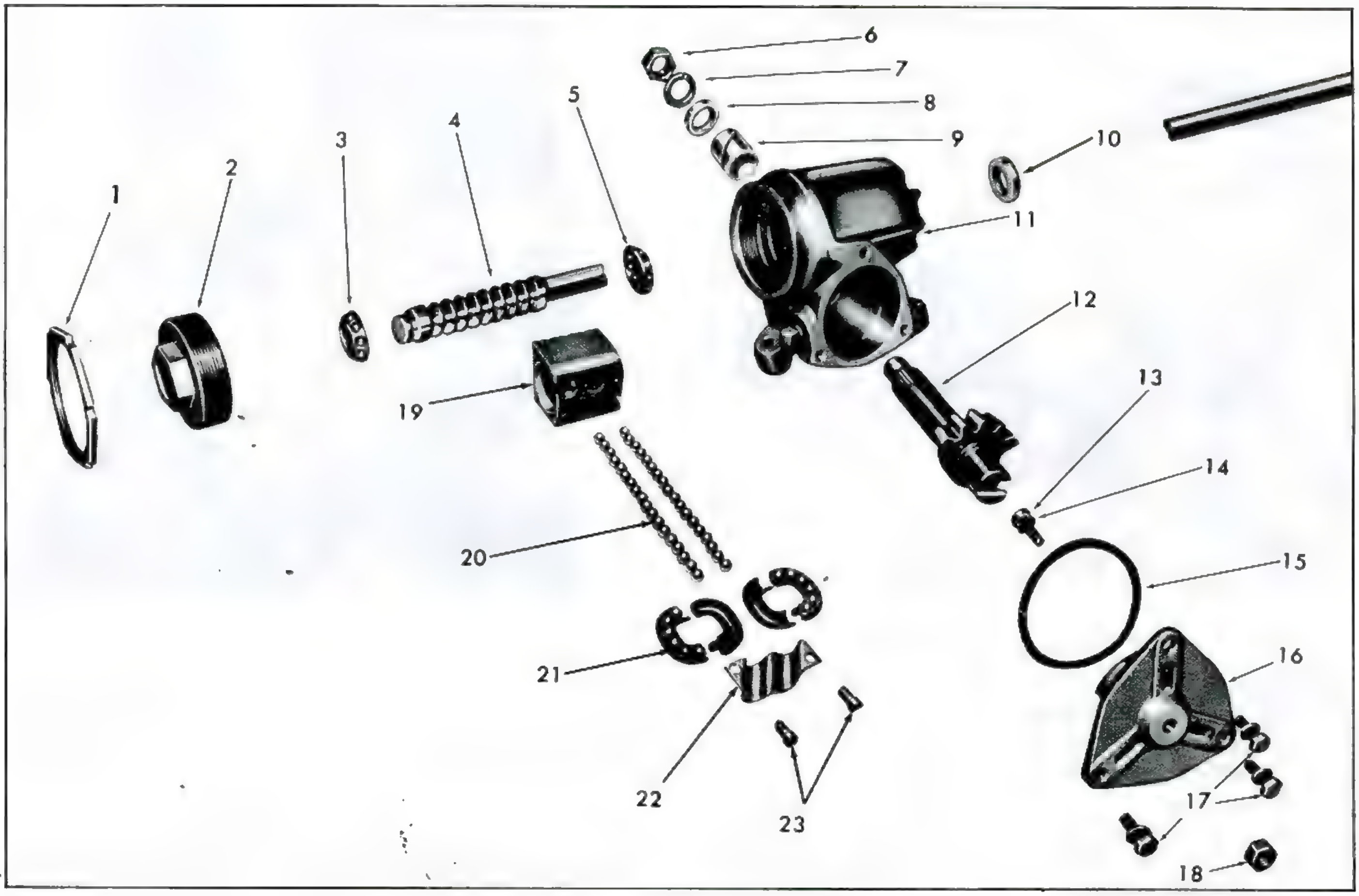


Fig. 8—Exploded View of Steering Gear

1. Wormshaft Bearing Adjuster Locknut
2. Wormshaft Bearing Adjuster
3. Wormshaft Bearing
4. Wormshaft
5. Wormshaft Bearing
6. Pitman Arm Nut
7. Pitman Arm Lock Washer
8. Pitman Shaft Seal
9. Pitman Shaft Bushing
10. Wormshaft Outer Seal
11. Steering Gear Housing
12. Pitman Shaft
13. Lash Adjuster Screw
14. Lash Adjuster Screw Shim
15. "O" Ring
16. Side Cover
17. Side Cover Screws and Lock Washers
18. Lash Adjuster Screw Locknut
19. Ball Nut
20. Balls
21. Ball Guides
22. Ball Guide Retainer
23. Ball Guide Retainer Screws

Inspect wormshaft seal for defects.

Inspect the pitman shaft for wear and check the fit of the shaft in the housing bushings.

Inspect the fit of the pilot on the end of the pitman shaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed.

Check ball guides for damage at ends where they pick up the balls from the helical path. Any damaged guides should be replaced.

Check steering gear wormshaft assembly for bent or damaged shaft.

Repairs

Sector Shaft Bushing Replacement

1. Support steering gear housing in an arbor press and press sector shaft bushing from housing with Tool J-8366-2, inserted from lower end of housing (fig. 11).
2. Press new bushing into position using Tool J-8366-1 (fig. 12).

NOTE: Service bushings are diamond bored to size and require no further reaming.

Side Cover Bushing Replacement

The entire side cover assembly, including bushing, is serviced as a unit and should be replaced where it is desired to replace the bushing.

Wormshaft and Sector Shaft Seal Replacement

If either of the above seals indicates need of replacement, it should be removed and a new seal pressed into position in the housing. A suitable socket pressing on outer diameter of seal may be used.

NOTE: Care should be taken to insure that seal is not assembled in a cocked position.

Worm Bearing Cup

The worm bearing cup in the steering gear housing may be serviced as follows:

Removal

1. With gear dismantled and seal removed, cup may be tapped out of housing with a punch and hammer.
2. Use care to avoid damaging housing. Support it on a wood block while driving out old cup.

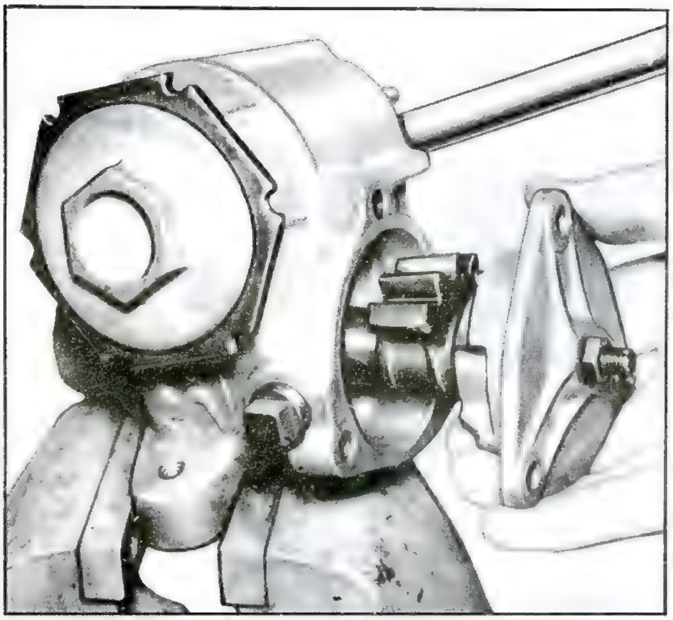


Fig. 9—Removing Pitman Shaft

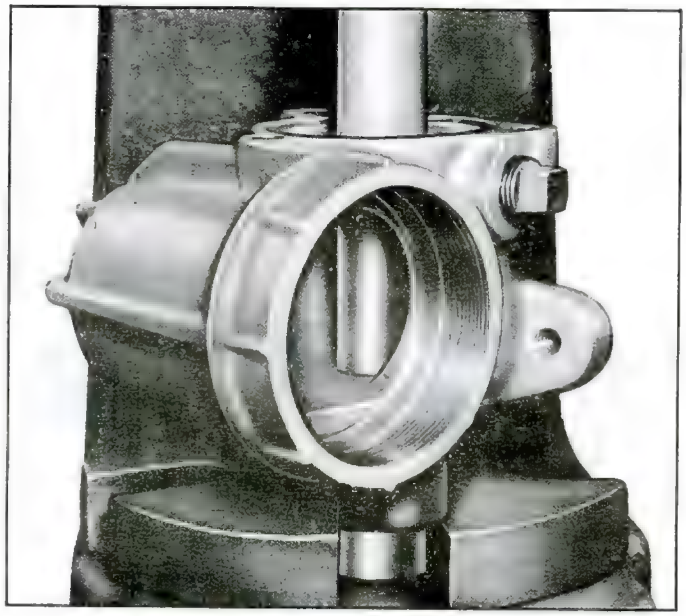


Fig. 11—Removing Sector Shaft Bushing

Installation

1. With all foreign material out of cup bore in housing, position new cup over bore. Place old cup on top of new and press new cup in with arbor press.

Ball Nut Assembly

1. Place the wormshaft flat on the bench and slip the nut over the worm with the ball guide holes up and the shallow end of the rack teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.
2. Count 48 balls into a suitable container. This is the proper number of balls for this ball nut. Drop 18 balls into each of two holes on the same side of nut (this operation may be performed from either side of nut, but two holes on the same side must be used, not two holes on same end). Turn the worm gradually away from hole being filled (fig. 13). Continue until all 36 balls are installed.

   NOTE: In cases where the balls are stopped by the end of the worm, hold down those balls already dropped into the nut with the blunt end of a clean rod or punch and turn the worm in the reverse direction a few turns. The filling of the circuit can then be continued. It may be necessary to work the worm back and forth, holding the balls down first in one hole then the other, to close up the space between the balls and fill the circuit completely and solidly.
3. Place remaining 12 balls in halves of ball guides, six in each of two halves (fig. 14).
4. Close this half of guide with the other half. Hold the

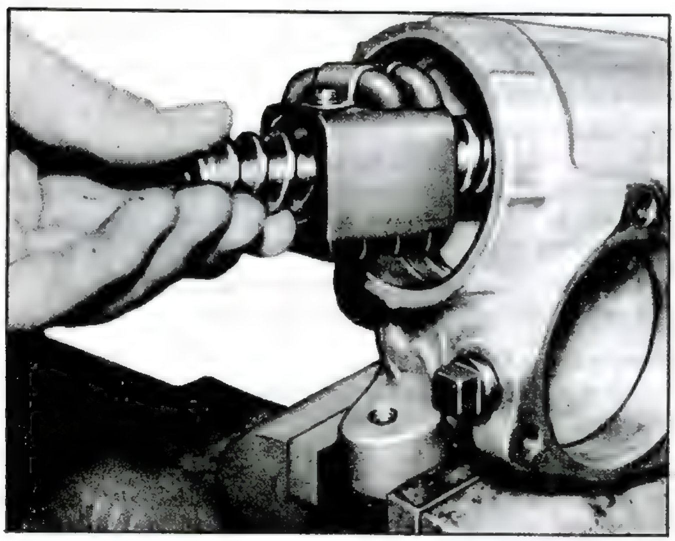


Fig. 10—Removing Wormshaft and Ball Nut

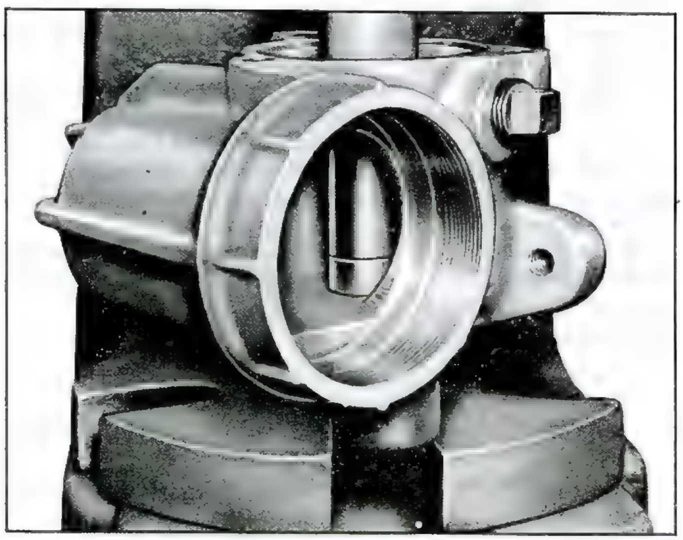


Fig. 12—Installing Sector Shaft Bushing

two halves together and plug each open end with vaseline so balls will not drop out while installing guide.

5. Push the guides into the guide holes of the nut (fig. 15). If the guides do not push all the way down easily, tap lightly into place.
6. Assemble the ball guide clamp to the nut, being sure to use a lock washer under the clamp screw, then tighten the screw securely.

Check the assembly by rotating the nut on the worm to see that it moves freely. Do not rotate the nut to the end of the worm threads as this may damage the ball guides. If there is any "stickiness" in the motion of the nut, some slight damage to the ends of the ball guides or to other gear components may have been overlooked.

Assembly

After a major service overhaul where all of the original factory installed lubricant has been washed out of the steering gear assembly, the thread of the adjuster, side cover bolts and lash adjuster should be coated with a suitable non-drying, oil resistant sealing compound such as Permatex No. 2. This is to prevent leakage of gear lubricant from the steering gear assembly. The compound should not be applied to female threads and extreme care should be exercised in applying this compound to the bearing adjuster, as the compound must be kept away from the wormshaft bearing. Also apply grease to the worm bearings, pitman shaft bushing, and ball nut teeth.

1. With wormshaft and pitman shaft seals and bearing cups installed and ball nut assembly installed on wormshaft, slip upper ball bearing over wormshaft and insert wormshaft and nut assembly into housing, feeding end of shaft through upper ball bearing cup and seal.
2. Place ball bearing in adjuster cup and install adjuster and locknut in lower end of housing.

Fig. 14—Filling Ball Guides

3. Assemble the lash adjuster with shim in the slot in the end of sector shaft. Check the end clearance which should not be greater than .002" (fig. 16). For the purpose of adjusting this end clearance, a steering gear lash adjuster shim unit is available. It contains four shims—.063", .065", .067" and .069" thick.
4. After lash adjuster end clearance has been adjusted, start shaft pilot into side cover. Then, using a screw driver, through the hole in cover, turn lash adjuster in a counter-clockwise direction to pull sector shaft pilot into side cover as far as it will go.
5. Rotate wormshaft by hand until ball nut is about in the center of travel. This is to make sure that the rack and sector will engage properly with center tooth of the sector entering center tooth space of the nut.

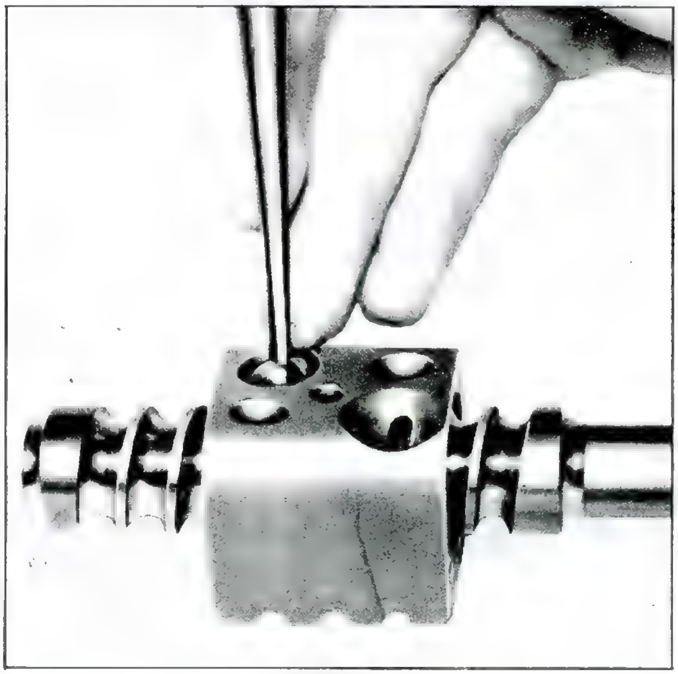


Fig. 13—Installing Balls in Nut

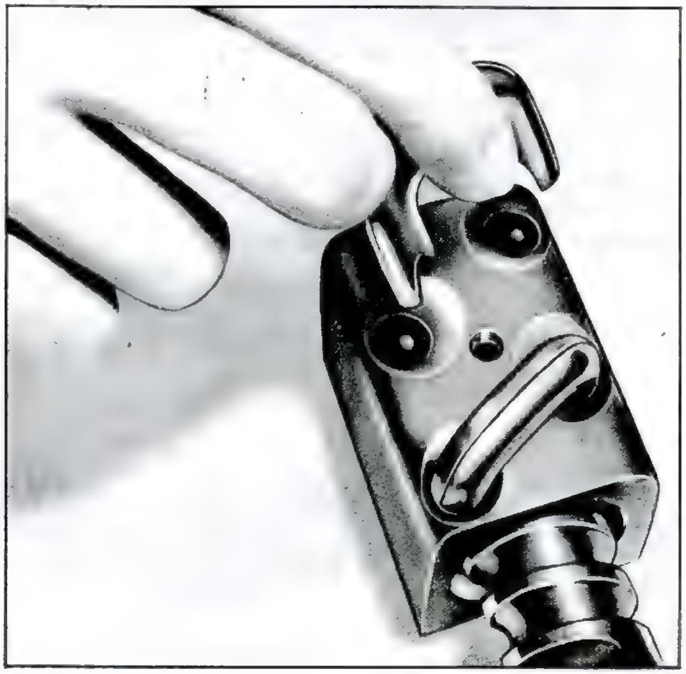


Fig. 15—Inserting Ball Guides in Nut

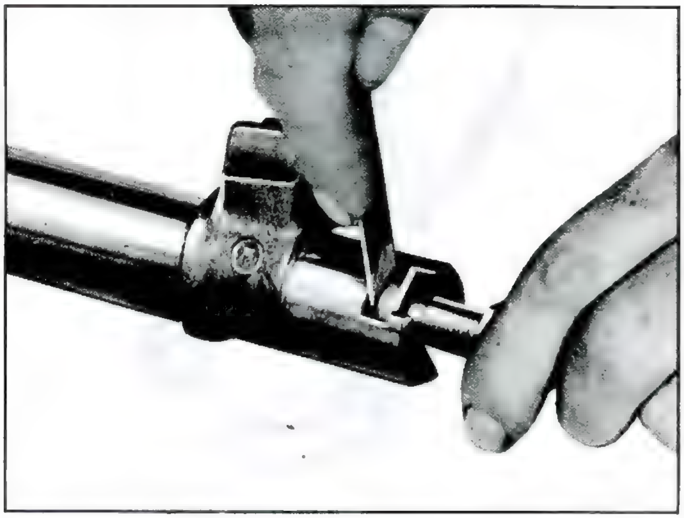


Fig. 16—Checking Lash Adjuster End Clearance

6. Place a new gasket on side cover, then push side cover assembly including sector shaft into place. After making sure there is some lash between rack and sector teeth, assemble and tighten side cover bolts.

   NOTE: After gear is assembled, it is suggested that it be installed in the vehicle and adjusted instead of adjusted on the work bench. Adjust as outlined in this section, under Maintenance and Adjustments.

Installation (Regular Production)

1. From the bottom of the vehicle guide the steering shaft up through the mast jacket being careful not to damage the upper bearing.
2. Position steering gear in place and secure with the 3 mounting bolts. Torque to 25-35 ft. lbs.
3. With steering gear on center, or highpoint position, install pitman arm, washer and nut. Torque to 80-105 ft. lbs.
4. Lower front of vehicle, and with the spacer in proper position on upper steering shaft and bearing, install steering wheel as previously outlined.
5. Adjust steering gear as outlined under Maintenance and Adjustments.

Installation (W/Telescoping Mast Jacket)

1. From the bottom of the vehicle guide the steering gear and shaft into position being careful to align the coupling with the notch in the upper steering shaft.
2. Secure the steering gear in place with the 3 mounting bolts. Torque to 25-35 ft. lbs.
3. With steering gear on center, or high position, install pitman arm, washer and nut. Torque to 80-105 ft. lbs.
4. Install steering coupling upper bolt and torque to 22-27 ft. lbs.
5. Adjust steering gear as outlined under Maintenance and Adjustments.

MAST JACKET

Removal

1. Remove steering wheel, as outlined under Steering Wheel Removal, also remove the sleeve and spring located around the shaft just under the steering wheel.
2. Disconnect directional signal wires from chassis wiring harness.
3. Remove the clamp bolt at the lower mast jacket bracket.
4. While supporting the mast jacket remove the 2 attaching bolts at the upper mast jacket bracket.
5. Pull the mast jacket up through the lower bracket clamp and out of the vehicle.

Repairs

Upper Bearing Replacement

1. Carefully pry out horn contact plate from directional signal switch.

   CAUTION: Contact plate will bend easily.

2. Pull upper mast jacket bearing from directional signal switch assembly.

Installation

1. Position bearing into directional signal switch and press by hand into place.
2. Place horn contact plate into directional switch, with the horn contact terminal engaging the horn wire connector, and press into position by hand.

Lower Seal Replacement

The lower mast jacket seal may be pried out when necessary and a new seal cemented into place.

Installation

1. Position mast jacket over steering shaft and slide into lower bracket clamp.
2. Install the two mast jacket upper bracket attaching bolts. Do not tighten.

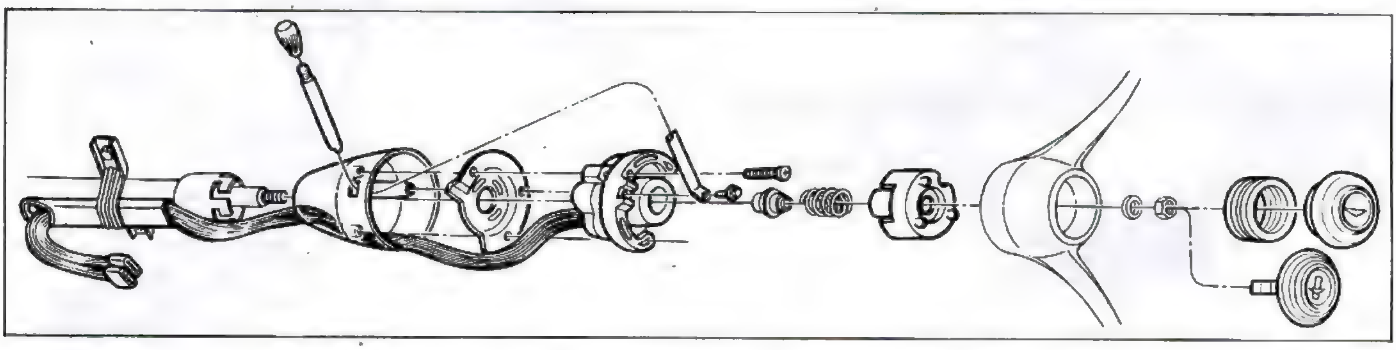


Fig. 17—Exploded View of Mast Jacket and Steering Wheel

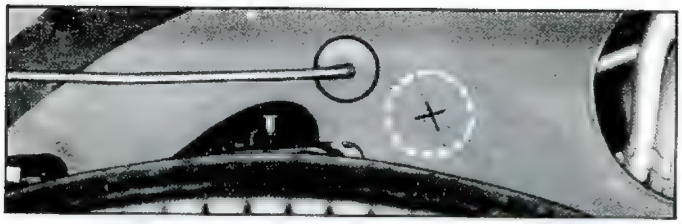


Fig. 18—Splash Shield Access Hole Location

3. Install lower bracket clamp bolt. Do not tighten.
4. Connect directional wiring to chassis wiring harness.
5. With the spring and sleeve in place, install steering wheel as outlined under Steering Wheel Installation.
6. Adjust mast jacket as outlined under Steering Shaft and Mast Jacket Relationship and Alignment in this section.
7. Install battery ground cable.

TELESCOPING MAST JACKET

Removal

1. Disconnect battery ground cable from battery.
2. Raise front of vehicle and drill a 2" diameter hole in the left front wheel splash shield (fig. 18). Then remove the upper steering coupling bolt and nut.
3. Lower vehicle and disconnect the two directional signal wiring connectors from chassis harness.
4. Remove the clamp bolt at the lower mast jacket bracket.
5. While supporting the mast jacket remove the 2 attaching bolts at the upper mast jacket bracket.
6. With the mast jacket in the full collapsed position, pull it up through the lower bracket. It may be necessary to rotate the mast jacket slightly to allow the

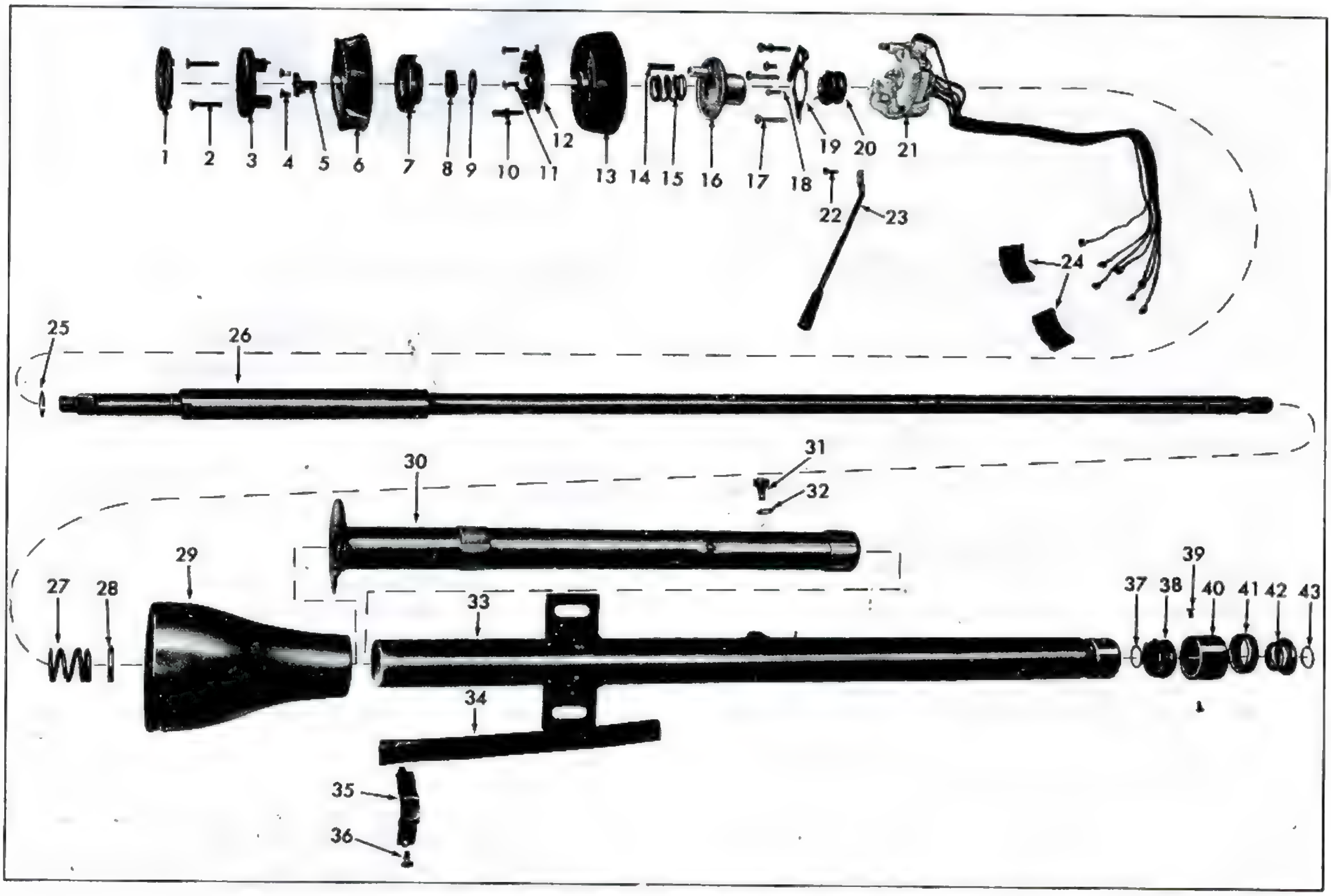


Fig. 19—Exploded View of Telescoping Mast Jacket

1. Horn Button Ornament Assembly
2. Retaining Screws
3. Horn Button
4. Lock Screws
5. Lock Bolt
6. Locking Knob
7. Horn Button Plate
8. Steering Shaft Nut
9. Steering Shaft Washer
10. Stop Stud
11. Screws
12. Horn Contact Assembly
13. Steering Wheel Hub
14. Horn Contact Spring
15. Steering Shaft Spring
16. Cancelling Cam
17. Directional Switch Screws
18. Upper Bearing Screws
19. Upper Bearing Plate
20. Upper Bearing
21. Directional Switch
22. Lever Screw
23. Directional Lever
24. Directional Wiring Connectors
25. Upper Snap Ring
26. Steering Shaft Assembly
27. Damper Spring
28. Damper Washer
29. Directional Housing
30. Inner Mast Jacket
31. Stop Bolt
32. Lock washer
33. Outer Mast Jacket
34. Directional Wiring Cover
35. Directional Wiring Clamp
36. Screw
37. Lower Snap Ring
38. Lower Bearing
39. Screws
40. Lower Bearing Retainer
41. Felt Seal
42. Lower Spring and Retainer
43. Lower Spring Snap Ring

Fig. 20—Removing Lower Snap Ring

lower bearing retaining screws to pass through the notches provided in the lower bracket.

Disassembly (Fig. 19)

1. Clamp mast jacket in vise by dash bracket.
2. Remove horn button ornament and retaining ring by prying up with a small screw driver at one of the three notches.
3. Remove the horn button by removing the 2 retaining screws.
4. Turn the lock handle approximately 90° counter-clockwise and remove the 2 retaining screws holding the lock knob to the lock bolt.
5. Remove the lock bolt by turning it counter-clockwise and remove the lock knob.
6. Remove the steering wheel from the hub by removing the six attaching screws.
7. Remove the horn button plate by prying it out of the contact assembly with a small screw driver.
8. Remove steering shaft nut and washer.
9. Remove horn contact assembly by removing the 2 phillips head screws and the stopping stud and lift out horn contact spring.
10. Install a 5/16 x 18 x 1/4 cap screw into center of steering shaft and using Tool J-2927 remove steering wheel hub from steering shaft.
11. Remove spring and cancelling cam from steering shaft.
12. Remove turn signal lever and retaining screw.
13. Remove the three directional signal switch retaining screws.
14. Remove wiring clamps and cover from directional wires.
15. Remove the wire terminals from the two plastic connectors using a small thin bladed screw driver. To facilitate reassembly note the color codes of the wires.
16. Carefully pull the directional signal switch out of the housing while guiding the wiring.
17. Remove snap ring from lower end of mast jacket (fig. 20).
18. Remove the retainer, felt seal and spring from lower end of mast jacket.
19. Pull steering shaft out of the upper end of the mast jacket, remove the cap screw previously installed

Fig. 22—Directional Housing Guide Position

and allow the locking rod to slide out the upper end of the shaft.

20. The two snap rings and the stop and spring may be removed from the shaft at this time if necessary.
21. Remove the mast jacket guide bolt and pull the inner mast jacket out of the outer mast jacket.
22. The directional housing can now be removed from the outer mast jacket.
23. Remove the lower bearing retaining screws and retainer from the lower end of the mast jacket.
24. Remove the lower bearing from the mast jacket.

Assembly

1. Place directional housing on to outer mast jacket and carefully slide inner mast jacket into place.
2. With the spring, stop and both snap rings in place as in Figure 21. Insert steering shaft into mast jacket from the upper end.
3. Install the lower bearing into the mast jacket and carefully tap in place.
4. Install lower bearing retainer and secure with the two screws.
5. With the lower spring retainer snapped into place on the spring and the felt seal over outside of spring, install the unit on the lower end of steering shaft and slide into place. Secure with snap ring.
6. By sighting through guide bolt hole align groove of inner mast with the hole and install guide bolt.

Fig. 21—Steering Shaft Assembly

NOTE: If upper bearing was removed from directional switch reinstall bearing, retaining plate and the 2 attaching screws.

7. Align wire guide in directional housing with cutout in inner mast jacket (fig. 22) and install directional signal switch into housing. Secure with the three retaining screws.

   CAUTION: Be sure directional wiring is routed properly through guide in housing.

8. Install directional wiring cover over wires and slide it up into place in the directional housing guides.
9. Engage wiring clamp tang into hole provided in mast jacket and secure with retaining screw.
10. Install directional switch lever and screw.
11. Place cancelling cam and spring in position.
12. Install horn contact plate assembly into steering wheel hub, be sure mark on contact plate is in line with mark on hub. Secure with the two retaining screws and the stop bolt. The stop bolt goes into the hole opposite of the marks.
13. Place contact spring into cancelling cam tower and align cancelling cam tower with hole in steering wheel hub and alignment mark on steering shaft with mark on steering wheel hub then position hub on upper steering shaft secure with washer and nut.
14. Install the horn button plate making sure the mark on it lines up with the mark on the steering wheel hub.
15. Position steering wheel on the hub, aligning the marks and secure with the six attaching screws.
16. Position locking rod into upper end of steering shaft and place lock handle into position. Screw lock bolt into upper end of steering shaft.
17. Using a phillips head adapter and an in. lb. torque wrench torque the lock bolt to 40 in. lbs., and position handle fully clockwise. Align the nearest holes in the handle with the lock bolt by backing off the handle slightly counter-clockwise, and secure with retaining screws.

   NOTE: Handle must lock the telescoping mechanism in the lock or full clockwise position and release it when fully counter-clockwise. Adjustment of this lock is made as in Step 17.

18. Install horn button onto horn cap. Be sure lug on horn button is in line with the double hole in the cap. Then secure with the two retaining screws.
19. Install the horn cap to the horn button making sure the top of the ornament is in line with the marked screw hole of the horn button.
20. Install directional wires into connectors using color code noted on removal.

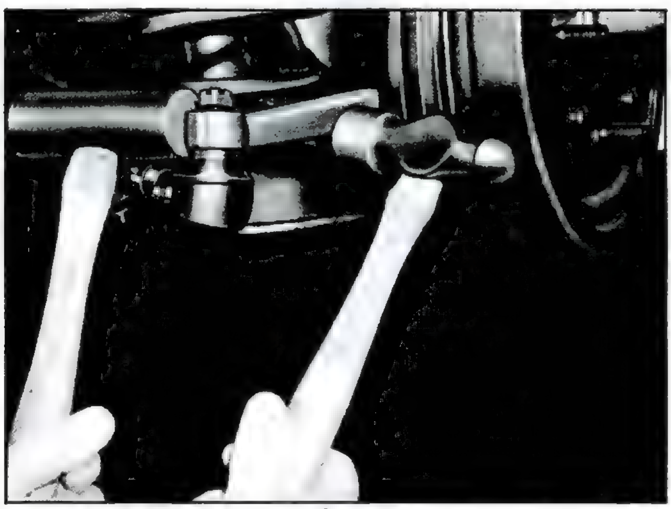


Fig. 23—Freeing Ball Stud

Installation

1. With the steering column locked in full down position, slide the steering shaft and mast jacket down through the lower bracket. Align the lower bearing retainer screws with the notches in the bracket.
2. With the front of the vehicle raised and using an assistant to guide the steering shaft into the coupling, insert the steering shaft into the coupling until the slot on the shaft aligns with the bolt hole. Secure with bolt and nut, torque to 22-27 ft. lbs.
3. Lower vehicle and install dash bracket mounting bolts.
4. Install lower bracket clamp bolt and torque 100-140 in. lbs.
5. Connect the directional wiring connectors to the chassis wiring harness.
6. Install battery ground cable.

STEERING LINKAGE

Tie Rods

There are two tie rods used on all models. Each tie rod is of three piece construction, consisting of the tie rod and two tie rod end assemblies. The ends are threaded into the rod and locked with clamps. Right and left hand threads are provided to facilitate toe-in adjustment and steering gear centering.

The tie rod ends are self adjusting for wear and require no attention in service other than periodic lubrication and occasional inspection to see that ball studs are tight. Replacement of tie rod ends should be made when excessive up and down motion is evident or if any lost motion or end play at ball end of stud exists.

Removal

1. Remove cotter pins from ball studs and remove castellated nuts.
2. Free ball stud from steering arm by backing up boss with a large hammer or dolly and striking opposite side with hammer of slightly lighter weight (fig. 23).
3. Remove inner ball stud from relay rod, using same procedure as described in Step 2.
4. To remove tie rod ends from tie rods, loosen clamp bolts and unscrew end assemblies.

Installation

1. If the tie rod ends were removed, install ends on tie rod making sure both ends are threaded an equal distance into the tie rod.
2. Make sure that threads on ball studs and in ball stud nuts are perfectly clean and smooth. Install neoprene seals on ball studs.

   NOTE: If threads are not clean and smooth, ball studs may turn in tie rod ends when attempting to tighten nut.

3. Install ball studs in steering arms and relay rod.
4. Install ball stud nut, tighten securely and install cotter pins. Lubricate tie rod ends.

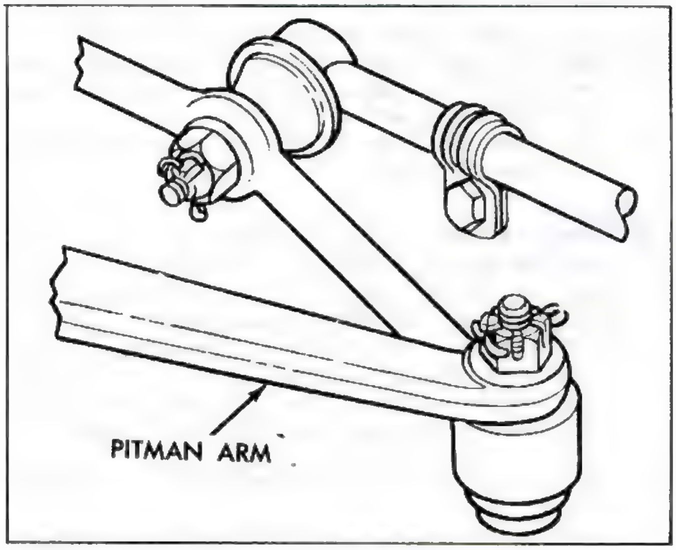


Fig. 24—Clamp Flange Position

5. Adjust toe-in as described in Section 3.

   NOTE: Before locking clamp bolts on tie rods, make sure that the tie rod ends are in alignment with their ball studs (each ball joint is in the center of its travel). If the tie rod is not in alignment with the studs, binding will result. Outer clamps (those closest to wheels) should be installed so that clamp bolts are at right angles to slot in sleeve.

The flanges of the inner clamps must be pointing straight down and the bolt parallel with the ground as shown in Figure 24.

Relay Rod

Removal

1. Remove inner ends of tie rods from relay rod as described under Tie Rod—Removal.
2. Remove cotter pin and nut from relay rod bolt at pitman arm and idler arm and remove relay rod from both points.

Cleaning and Inspection

Remove accumulated grease and dirt from assembly and inspect for damage or excessive wear.

Repairs

The relay rod has a bushing at the pitman arm end which may be replaced as follows:

Bushing Removal

1. Use soft hammer to drive bolt out of bushing (fig. 25).
2. Use suitable size socket to press rubber and sleeve out of relay rod.

Bushing Replacement

1. Place relay rod on press, resting on a deep socket of suitable size. Use Tool J-8357 to press new bushing into place in relay rod.

Installation

1. Install idler arm and pitman arm to relay rod. Install and tighten nuts to 29 to 43 ft. lbs. and install cotter pins.

   CAUTION: After relay rod bushing is replaced, care must be taken to install the pitman arm to the relay rod with the steering gear in the straight ahead position. When installing nut on the bushing bolt be sure to hold the hex head of the bolt so that no twisting of the bushing will occur. If the bushing is twisted, or if the pitman arm is not correctly aligned, poor steering will result.

2. Adjust tie rod ends to relay rod as previously described under Tie Rods.
3. Adjust toe-in (See Section 3) and align steering wheel as described previously in this section under Steering Wheel Alignment and High Point Centering.

Idler Arm

Removal

1. Remove cotter pin from the idler arm and remove nut.
2. Tap on side of relay rod at idler ball stud while using a heavy hammer or similar tool as a backing. Pull down on relay rod to remove from stud.
3. Idler arm assembly can be removed by removing the two attaching bolts, nuts and washers.

Installation

Reverse above removal procedures and torque idler arm nut at relay rod from 29-43 ft. lbs. The idler bracket to frame attaching nuts should be torqued from 14-20 ft. lbs.

Steering Arms

If, through collision or other damage, it becomes necessary to remove and replace either steering arm, proceed as follows:

Removal

1. Remove tie rod from steering arm as outlined under Steering Linkage—Tie Rod—Removal, in this section.
2. Remove front wheel, hub and brake drum as a unit by removing hub cap and dust cap, cotter pin or locking

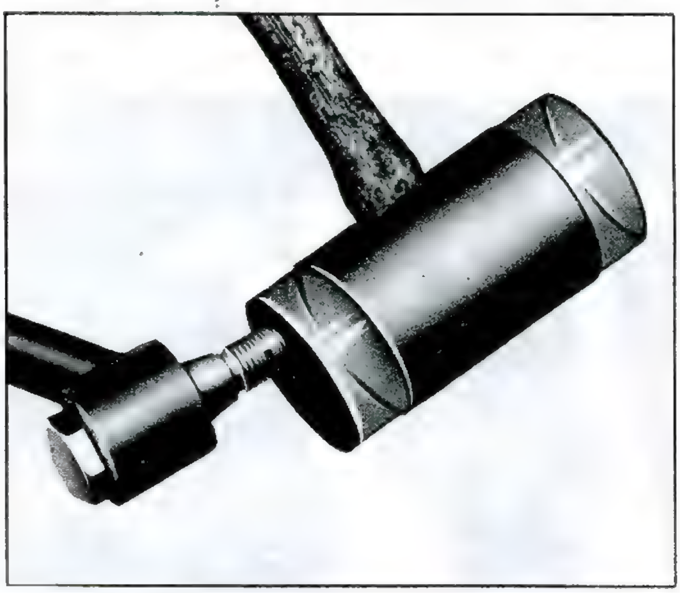


Fig. 25—Removing Pivot Bolt

ring from spindle nut and the spindle nut. Pull assembly toward outside of vehicle. If removal is difficult, it may be necessary to back off brake adjustment to increase brake shoe-to-drum clearance; see "Brake Drum Removal" in Section 5 of this manual.
3. With wheel and drum assembly removed, steering arm retaining bolt heads are accessible and removal of steering arm from vehicle may be accomplished by removing retaining nuts.

Installation

1. Place steering arm in position on vehicle and install retaining bolts. Note that longer bolt is installed in forward hole.
2. Install nuts and torque to 40-50 ft. lbs. Use only the special locknut listed for this use in the Chevrolet Parts Catalog.
3. Pack wheel bearings using a high quality wheel bearing lubricant. Install bearings and wheel-hub-brake drum assembly removed previously.
4. Install keyed washer and spindle nut. Proceed as outlined under Front Wheel Bearings—Adjust in Section 3 of this manual.
5. Install tie rod ball stud in steering arm. Be sure that the dust cover is in place on ball stud.
6. Install castellated nut on ball stud, tighten securely and install cotter pin.
7. Following directions given in Section 3 of this manual, check cornering wheel relationship and toe-in.

SPECIAL TOOLS

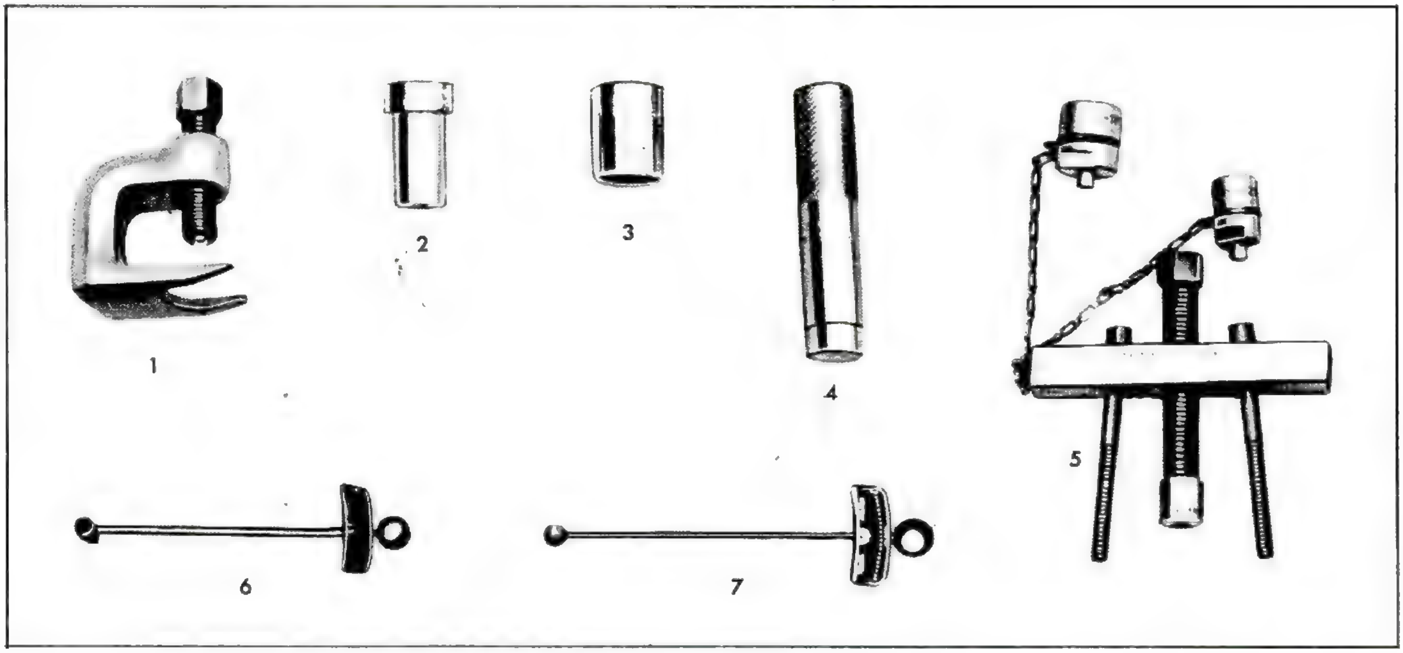


Fig. 26—Special Tools

1. J-6627 Pitman Arm Puller
2. J-8366-1 Sector Shaft Bushing Installer
3. J-8357 Relay Rod Bushing Installer
4. J-8366-2 Sector Shaft Bushing Remover
5. J-2927-A Steering Wheel Puller
6. J-1315 Torque Wrench (in. lbs.)
7. J-1313 Torque Wrench (ft. lbs.)

SECTION 10
WHEELS AND TIRES

INDEX

GENERAL DESCRIPTION

All Corvair Models are equipped with all steel welded wheels. The wheel rims are designed to accept matching size tubeless tires. The wheels are connected to the front wheel hubs and the rear axle shaft flanges with five studs and nuts each. All vehicles have snap-on type hub caps or wheel trim covers.

'he tire size for all models is 6.50 x 13.4 ply rating.

The spare tire (fig. 1) is mounted in the engine compartment. A scissors type jack stowed under the tire, and a combination ratchet type jack wrench, wheel nut wrench and hub cap remover are supplied with all vehicles.

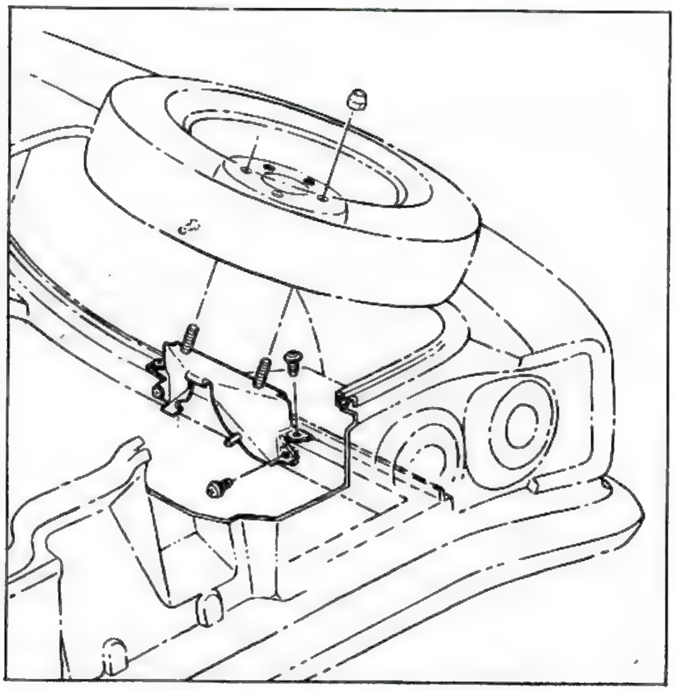


Fig. 1—Spare Tire Storage

MAINTENANCE

TIRES

PRESSURE

Keep tires inflated to the recommended pressures. Over-inflation can adversely affect riding comfort, quietness and tire life, while under-inflation affects vehicle handling and tire life.

Recommended Tire Inflation Pressures
(Based on Original Equipment Tires)

	Tire Ply Rating	Average Owner Service Up to 5-Passenger Load (Normal Inflation) Cold* Front	Cold* Rear	Hot** Front	Hot** Rear	Continuous Service with up to Full Load Capacity on High Speeds Over 5-Passenger Load (Maximum Inflation) Cold* Front	Cold* Rear	Hot** Front	Hot** Rear
All Models	4	15	26	18	30	15	30	18	35

*After car has been parked for 3 hours or more, or driven less than one mile.
**Pressures can rise as much as 7 pounds above cold figures depending on loads, carried, length of driving, and car speed prior to checks.
@Front tire loads do increase appreciably with cargo loading, therefore, the above is recommended for best steering characteristics.

VEHICLE LOADING AND TIRE SELECTION

Full Load Capacity of the vehicle is:

All Models — 1100 lbs. Total, 3 Passengers Front Seat
3 Passengers Rear Seat
200 lbs. Luggage

Manufacturer's original equipment 4-ply rating tires are designed and thoroughly tested to meet all normal requirements of your vehicle as outlined above.

For continuous full load service or heavy duty operation, eight ply rated or oversized tire options are recommended at the above recommended tire pressures.

Check tire pressures each time a car is brought in for service, not only as a convenience to the owner, but also to reduce owner complaint of riding, steering or tire wear which many times is due to improper tire inflation. Check tires with an accurate gauge.

Always reinstall tire valve caps to keep dust, water and mud out of the valve core.

INSPECTION

Every few thousand miles and at each lubrication, tires should be checked for sharp objects or stones in the tread. If tire is punctured, it should be repaired using one of several repair kits available through tire manufacturers' outlets.

WEAR

Misalignment

This is wear due to excessive toe-in or toe-out. In either case, tires will revolve with a side motion and scrape the tread rubber off. If misalignment is severe, the rubber will be scraped off of both tires (or all four tires if front and rear toe is not correct); if slight, only one will be affected.

The scraping action against the face of the tire causes a small feather edge of rubber to appear on one side of the tread and this feather edge is certain indication of misalignment (fig. 2). The remedy is readjusting toe-in within specifications, or rechecking the entire front end alignment or rear toe setting if necessary.

Heel and Toe

This is a saw-toothed effect where one end of each tread block is worn more than the other.

The end that wears is the one that first grips the road when the brakes are applied.

Heel and toe wear is less noticeable on rear tires than on front tires, because the propelling action of the rear wheels creates a force which tends to wear the opposite end of the tread blocks. The two forces, propelling and braking, make for more even wear of the rear tires, whereas only the braking forces act on the front wheels, and the saw-tooth effect is more noticeable.

A certain amount of heel and toe wear is normal. Excessive wear is usually due to high speed driving and excessive use of brakes. The best remedy, in addition to cautioning the owner on his driving habits, is to interchange tires regularly.

Side

This may be caused by incorrect wheel camber, under-inflation, high cambered roads or by taking corners at too high a rate of speed.

The first two causes are the most common. Camber wear can be readily identified because it occurs only on one side of the treads, whereas underinflation causes wear on both sides (fig. 3).

There is, of course, no correction for high cambered roads. Cornering wear is discussed further on.

Center

This is caused primarily by overinflation of the tire (fig. 3). Invisible fabric damage can also be caused by overinflation.

Uneven

Uneven or spotty wear (fig. 4) is due to such irregularities as unequal caster or camber, bent front or rear suspension parts, out-of-balance wheels, brake drums out-of-round, brakes out-of-adjustment or other mechanical conditions. The remedy in each case consists of locating the mechanical defect and correcting it.

Fig. 2—Toe In or Toe Out Misalignment Wear

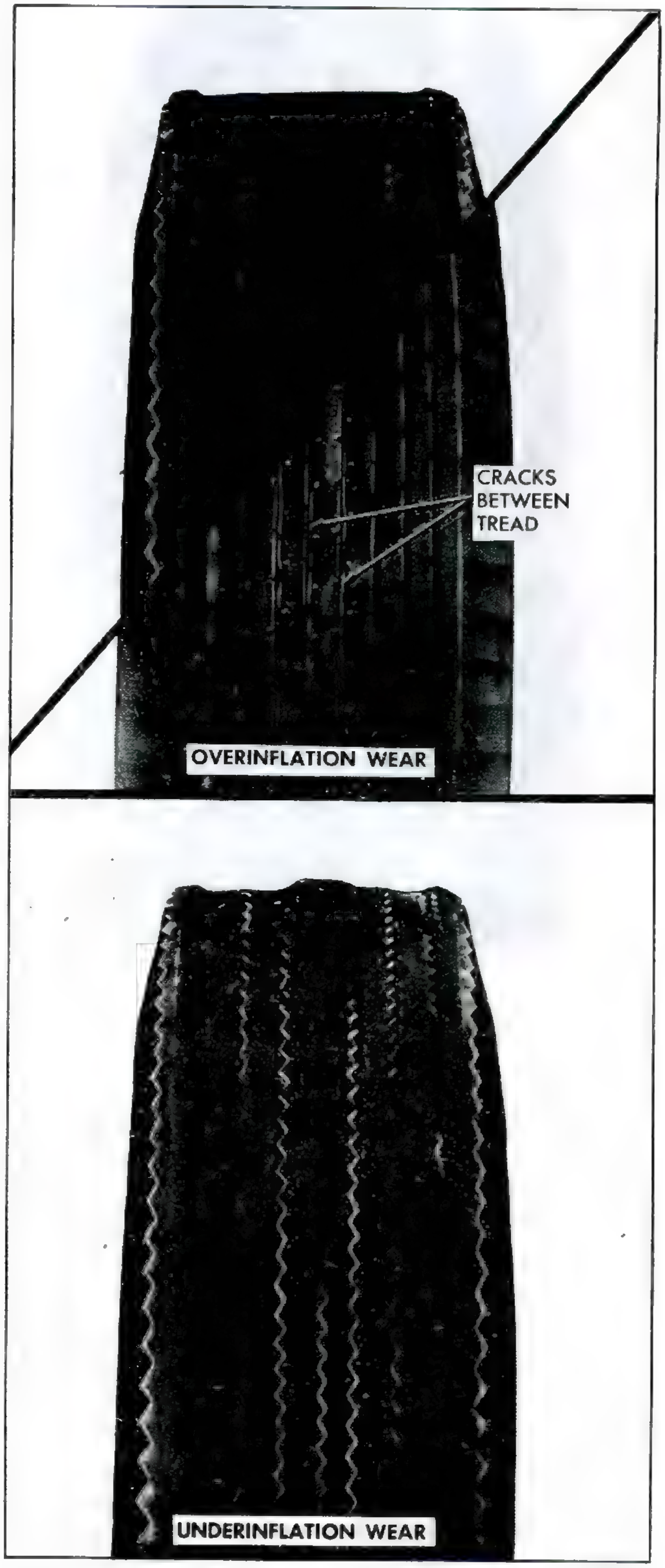


Fig. 3—Over and Under Inflation Wear

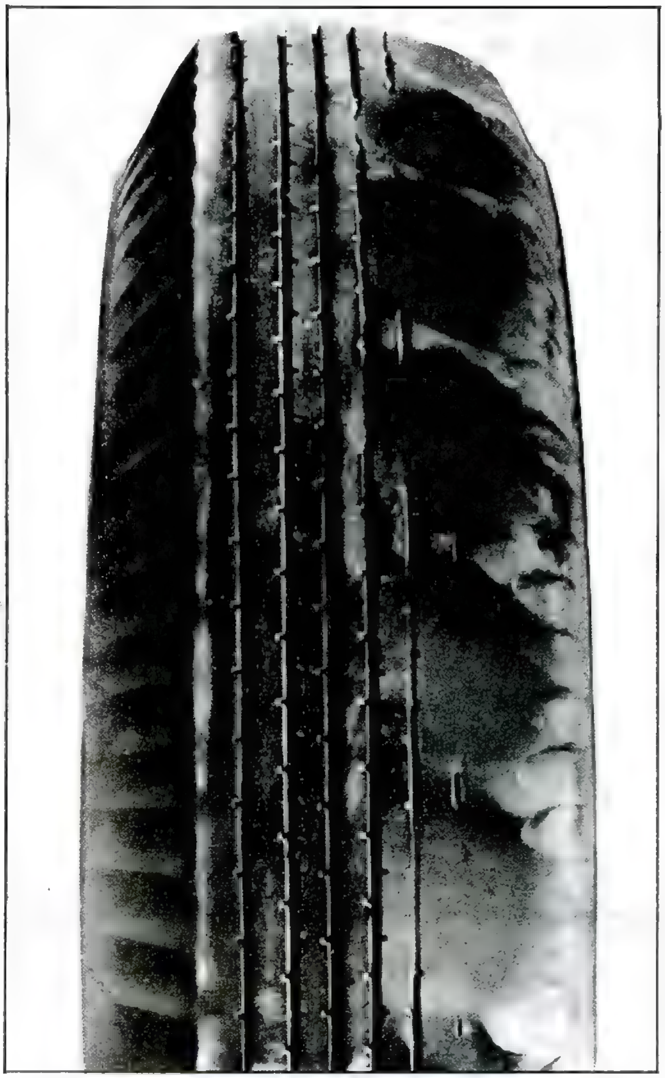


Fig. 4—Spot Wear

Cornering

Since the introduction of independently sprung front and rear wheels, improvements in spring suspension have enabled drivers to negotiate curves at higher rates of speed with the same feeling of security that they had with the older cars at lower speeds. Consequently, curves are being taken at higher speeds with the result that a type of tire wear called "Cornering Wear" (fig. 5), frequently appears.

When a car makes an extremely fast turn, the weight is shifted from an even loading on all four wheels to an abnormal load on the tires on the outside of the curve and a very light load on the inside tires, due to centrifugal force. This unequal loading may have two unfavorable results.

First, the rear tire on the inside of the curve may be relieved of so much load that it is no longer geared to the road and it slips, grinding off the tread on the inside half of the tire at an excessive rate. This type of tire shows much the same appearance of tread wear as tire wear caused by negative camber.

Second, the transfer of weight may also over-load the outside tires so much that they are laterally distorted resulting in excessive wear on the outside half of the tire, producing a type of wear like that caused by excessive positive camber.

Cornering wear can be most easily distinguished from abnormal camber wear by the rounding of the outside shoulder or edge of the tire and by the roughening of the tread surface which denotes abrasion.

Cornering wear often produces a fin or raised portion along the inside edge of each row in the tread pattern. In some cases this fin is almost as pronounced as a toe-in fin, and in others, it tapers into a row of tread blocks to such an extent that the tire has a definite step wear appearance.

The only remedy for cornering wear is proper instruction of owners.

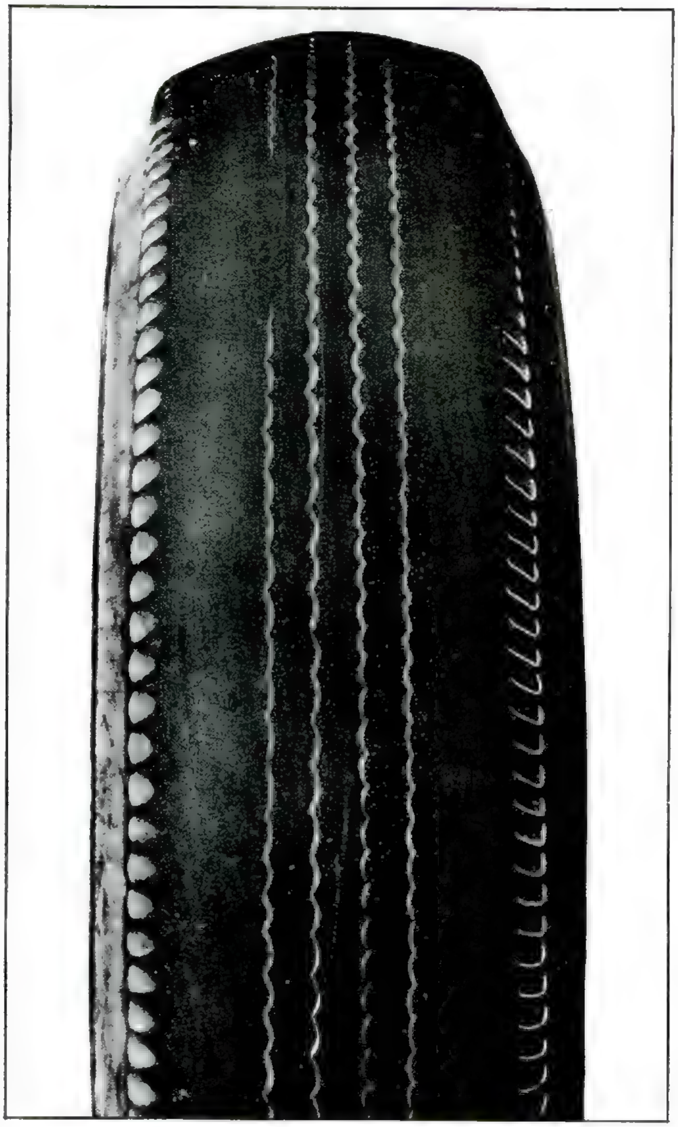


Fig. 5—Cornering Wear

ROTATION

To minimize the possibility of tire noise and to equalize tire wear, it is recommended that tires be interchanged every 6000 miles as shown in Figure 6 or more frequently in the case of extremely heavy wear. Interchanging tires will effectively prevent undue wear on any particular tire. If tire interchanging is followed as recommended above, all tires will have the same number of miles in each wheel position at the end of the fourth change. The car will have been driven 30,000 miles but each tire will have only 24,000 miles of use. When interchanging tires, inspect for signs of abnormal wear, bulging, etc., and stones, glass, and nails should be removed before reinstallation.

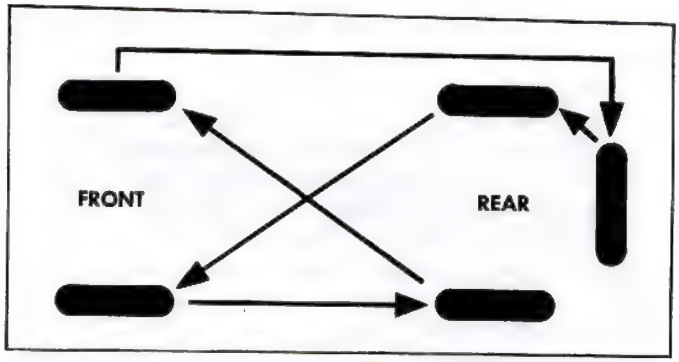


Fig. 6—Tire Rotation Plan

NOISE

Noise caused by the normal action of tire treads on various road surfaces is often confused with rear axle gears or other noises in the car.

The determination of whether tires are causing the noise complained of is relatively simple. The car should be driven at various speeds and note taken of part throttle, sudden acceleration and deceleration as axle and exhaust noises show definite variations under these conditions, while tire noise will remain constant. Tire noise is, however, most pronounced at speeds of approximately twenty or thirty miles per hour.

The tires may be further checked by driving the car over smooth pavement with the tires at normal pressure and again over the same stretch of pavement when the tires have been inflated to fifty pounds pressure. Reduce the tires to normal pressure one at a time to determine the faulty tire or tires. This high inflation pressure should immediately be reduced to normal after test. If the noise for which the test is being made is caused by tires, it will noticeably decrease when the tire pressure is increased, whereas axle noise should show no change in volume.

If, on inspection, the tires on the front wheels are found to be creating most of the noise the alignment of the front wheels should be checked, as excessive tire noise usually results from low tire pressure, incorrect alignment or from uneven tire wear.

CLEANING

A great deal of ordinary road dirt which collects on white sidewall tires may be sponged off with clear water or a mild soap solution.

A good brand of whitewall tire cleaner, however, is a quicker and more effective cleaner for removing dirt and stains from whitewall tires and in many cases it will remove stains and discoloration that the simpler method of soap and water will not remove.

Under no circumstances should gasoline, kerosene or any cleaning fluid containing a solvent derived from oil be used to clean whitewall tires. Oil in any form is detrimental to tire rubber and a cleaner with an oil base will discolor or injure whitewall tires.

CHANGE (W/WHEELS)

To change the road wheels using the jack that comes with the car, observe the following procedure:

1. Set hand brake and block front wheels if rear wheel is being changed.
2. Remove hub cap or wheel disc and break wheel mounting nuts loose.
3. Place the jack as directed under, General Information, Section 0 and raise car until wheel clears ground.
4. Remove wheel mounting nuts and remove wheel from hub or drum.
5. To replace road wheel, reverse the above instructions. Proper torque on nuts is 45-65 ft. lbs.

CAUTION: On models equipped with discs, index the pilot hole in the disc on the valve stem. (To insure that the anti-rotation notches in wheel disc register on lugs in wheel rim.)

WHEEL BALANCING

STATIC BALANCING (W/TIRE)

Static Balance (still balance) is the equal distribution of weight of the wheel and tire assembly about the axis of rotation so that the assembly has no tendency to rotate by itself. Static unbalance causes the pounding action of the front wheels that is called "tramp".

To correct static unbalance (front and rear): The quickest and best methods to correct static unbalance are through the use of wheel balancers which are commercially available. Refer to the Information and instructions included with these balancers.

DYNAMIC BALANCING (W/TIRE)

Dynamic Balance (running balance) requires the wheel to be not only in static balance, but balanced and running smoothly while turning on an axis which runs through the centerline of the wheel and tire perpendicular to the axis of rotation.

The quickest and best methods of testing and correcting dynamic unbalance are by the use of dynamic wheel balancers which are commercially available. These balancers include all necessary information on where and how the balancing weights should be placed. The following

information, however, will help in the correction of dynamic balance.

NOTE: Before attempting to balance the wheels, check to be certain that no foreign matter has been trapped in the wheel ventilation slots or in the accessory wheel discs. This is especially important if the vehicle has been run in soft mud and then parked in freezing weather.

When a wheel that is statically unbalanced is dynamically in balance the dynamic balance can be retained while correcting the static balance by installing the corrective weights so that half of the weight required is placed on the inner edge of the rim and the other half on the outer edge of the rim.

Dynamic unbalance can be corrected without destroying static balance by installing weights so half of weight required for dynamic balance is placed on the rim opposite the heavy point, while the other half is placed 180° away and on the opposite side of the rim.

RUN OUT (W/O TIRE)

The wheels should not run out (wobble) more than 1/16" as measured on the side of the rim at the base of the tire. Excessive run-out is the result of a bent wheel, an improperly mounted wheel, worn knuckle bearings or steering connections. These parts should be checked for correct adjustment, proper alignment and wear whenever excessive run-out is encountered.

The wheels should also run concentric with the steering knuckle spindle within 1/16 inch as measured on the tire bead seat of the rim with the tire removed.

Wheel run-out, eccentricity and balance are closely associated with steering and front wheel alignment. Further information on these subjects will be found under "Suspension".

SERVICE OPERATIONS

TIRES

Removal

Dismounting tubeless tires presents no problems if the correct procedures are used and the following precautions observed.

1. Remove the valve cap and valve core. Let out all the air.
2. Press the inner side of the tire into the rim well. Use bead loosening tool or if regular tire irons are used, take particular care not to injure or tear the sealing ribs on the bead.

   CAUTION: Never use tire irons with sharp edges or corners.

3. Using tire irons on the opposite side, remove bead, taking small "bites" around the rim.
4. Turn the tire over, and use two tire irons, one between the rim flange and the bead to pry the rim upward, the other iron to pry outward between the bead seat and the bead.

Installation

The general procedure is the same as for tube and tire installation except that extreme care must be exercised to prevent injury to the sealing bead and circumferential bead when forcing tire over rim.

1. Apply a light film of Ruglyde or other suitable rubber lubricant to sealing bead of tire.

   NOTE: The use of excessive lubrication may lead to rim slippage and subsequent breaking of oil seal.

2. Carefully mount the outer bead in usual manner by using tire irons, taking small "bites" around rim, being careful not to injure the tire bead.

   CAUTION: DO NOT use a hammer, as damage to the bead will result.

3. Install the inner bead in the same manner.

NOTE: If a seal cannot be effected in the foregoing manner with the rush of air it can be accomplished by applying to the circumference of the tire a tire mounting band or heavy sash cord and tightening with the use of a tire iron. On tire mounting machines, bouncing the tire assembly is not required. The tire should be lifted on the rim to force the top tire bead against the top rim flange. The weight of the tire will seat the bottom bead.

Installation of Tires and Tubes on Wire Wheels

For service repair, it is recommended that the following procedure be used.

1. Obtain a new top quality tube - never re-use a tube when remounting a tire.
2. Inspect flap - if it is cut from demounting or previous mounting or if it shows signs of folds, it should be replaced with U.S. Rubber 13-6DC flap or equivalent (Production #3819551).

Fig. 7—Cleaning Hole with Awl

Fig. 8—Filling Hole with Sealing Gun

3. Attach valve stem extension to valve stem of tube. (This helps get stem through hole in rim).
4. Install tube in tire and inflate with sufficient pressure to hold shape.
5. Insert flap in tire and carefully center in proper position.
6. Install tire, tube and flap assembly onto wheel in normal manner using extreme care not to puncture tube or flap. Use a motor driven tire mounting machine for best results.
7. Inflate tire, tube, flap and wheel assembly to 40 psi.
8. Deflate, unseat tire bead from rim and hand work the assembly to remove folds, if present.
9. Reinflate to desired pressure.

Repair

Hot Patch

With this method the patch uses its own fuel to be ignited when vulcanization takes place. This method is recommended for repairing punctures not exceeding 3/16" in diameter. Size of puncture can be determined by size of puncturing object.

1. Clean out the injury with an awl or hand rasp furnished with the tire repair kit (fig. 7).
2. Using sealing gun, fill puncture from outside of tire, see Figure 8.
3. Thoroughly clean inside of tire around injury with a suitable cleaner. Allow the cleaned area to dry.
4. Roughen area around injury with hand buffer or wire brush, See Figure 9.
5. Spread an even coating of a good grade of rubber cement over the puncture, slightly larger than the patch area, and allow to dry for 5 minutes.
6. Prepare patch material for igniting by loosening material slightly with point of a knife blade in then center of each side.
7. Carefully center hot patch over injury and hold in place using special hot patch clamp. Tighten clamp, maximum finger tight. (See Figure 10.)
8. Ignite patch material. Allow to cool 15 minutes or until cool enough to touch.
9. Carefully remove metal cup and blow out any ashes remaining in tire.

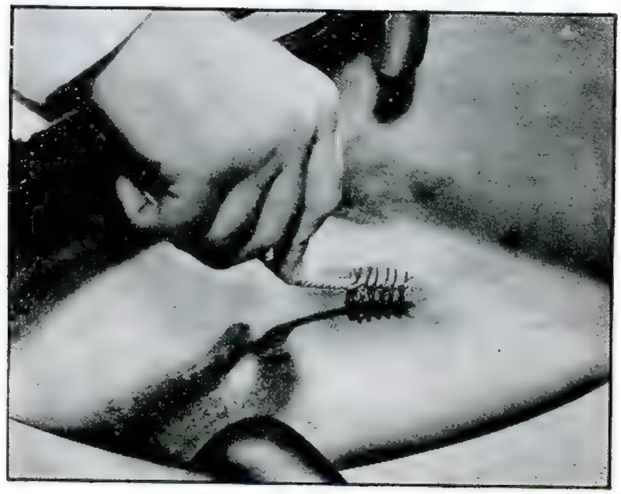


Fig. 9—Roughening Injury Area

Self Vulcanizing

In this method, a chemical action vulcanizes the patch. No external source of heat is necessary. Maximum size of puncture hole must not exceed 3/16" for this method of patching. (Larger size injuries must be repaired with press type vulcanizing equipment.) Many kits are manufactured and may be procured locally.

NOTE: This method should be used only for tires without soft puncture sealing material. The following procedure should be followed in using this kit.

1. Clean out the injury with the awl to remove puncturing object and foreign material.
2. Thoroughly clean the inside of the tire around the injury.
3. Fill the injury with Filler Rubber (Supplied in the kit) using the awl as follows:
   a. Clean awl needle and dip in Self-Vulcanizing Fluid. From inside of tire, force needle through tire until point extends beyond tread (fig. 11).
   b. Remove detachable handle from awl needle. Cut 1/8" by 1" strip of Filler Rubber, remove protective cover and insert into hole of awl needle with end of rubber strip extending beyond the needle (See Figure 12).

Fig. 10—Using Hot Patch Clamp

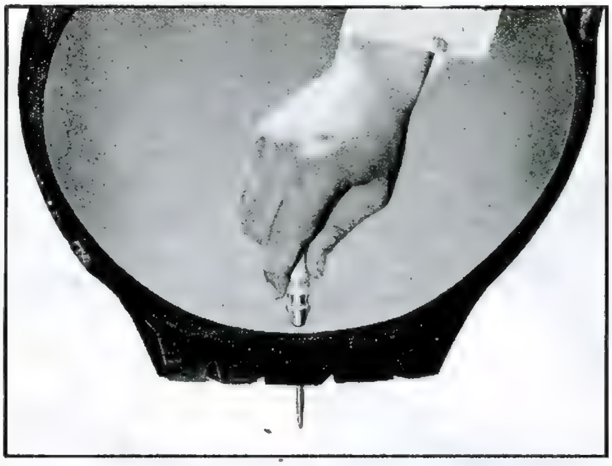


Fig. 11—Installing Needle in Tire Hole

c. Pull needle through tire with pliers. Filler Rubber will remain in the puncture. Cut off excess rubber flush with inside of tire. The injury may also be filled from the outside or inside with a sealant gun. Hold gun tip firmly against puncture and force sealant through until it comes through the other side of the tire.

4. Thoroughly roughen area around puncture, slightly larger than the patch, with wire brush included in kit. Remove all traces of lubricant, foreign matter, etc. Do not use additional solvent after buffing.
5. Apply self-Vulcanizing fluid over buffed area. Spread evenly with clean finger. Allow to dry for five minutes until no longer tacky. This is important.
6. Remove foil backing from patch. Place over injury and stitch down firmly, (fig. 13) especially the edges, with roller tool included in kit. To prevent buckling and insure a good seal, roll patch from the center toward the outer edges. Vulcanization is completed chemically. The repaired tire can be placed back in service immediately.

Self Vulcanizing Plug

Through the use of self-vulcanizing outside plug repair kits currently on the market, passenger cars tubeless

Fig. 12—Installing Filler Rubber in Hole

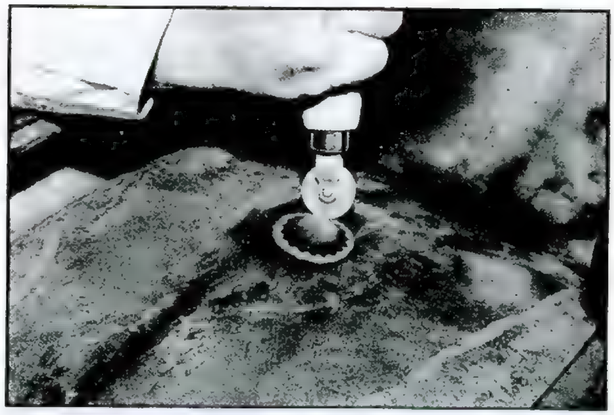


Fig. 13—Stitching Patch

tire punctures can now be permanently repaired without dismounting the tire from the rim and in many cases, without removing the wheel from the car.

Punctures which cannot be repaired, are those which are over 3/16 inch diameter, or leaks caused by incisions or ragged lacerations. Outside plug repairs can be made on all passenger car tubeless tires including those containing soft puncture sealing material.

The following procedure should be followed in using these kits.

1. Inflate tire to approximately 10 pounds pressure to support tire. Satisfactory repairs can be made with lower, or no pressure.
2. Locate puncture. Mark, and note direction of angle of puncture channel when removing puncturing object.
3. With cutter shaft of reaming tool in position, make circular cut (approx. 1/4 in. deep) around puncture hole, using twisting action (fig. 14).
4. Flip the screw-type cleaning needle of reaming tool into position and insert into puncture (fig. 15). Apply light pressure only and turn clockwise into puncture channel right down to the handle of the tool, carefully following the direction of the puncture. Retract tool by continuing to turn clockwise but with slight pulling action. Repeat this operation twice. Clean rubber particles, if any, from round cutter of needle, after each retraction. Make sure the small circular cut-out resulting from operation shown in Figure 14 has

Fig. 14—Making Circular Cut with Reaming Tool

Fig. 15—Cleaning Puncture with Cleaning Needle

been removed. Leave the needle in the puncture to prevent escape of air.

5. Prepare the plug for insertion into nozzle of the plug-insertion tool by pulling white stem of plug in metal tube until the head of the plug is seated tightly against the end of the tube (fig. 16). Cut off protruding end of plug stem.
6. Prepare the plug-insertion tool for insertion of plug:
   a. Insert cartridge of self-vulcanizing rubber cement into open tool.
   b. Fit plunger into recessed cartridge base.
   c. Remove cleaning needle from the puncture and pierce cartridge with point of needle inserted through the nozzle of the tool. Enlarge the opening by twisting (fig. 17).
7. Press the nozzle of the plug-insertion tool firmly over the puncture hole and squeeze cement from cartridge until red spring on the tool stops the action (fig. 18).

This deposits part of the cement. For repairs of punctures between narrow tread grooves attach short extension tube.

8. Insert the metal tube with plug into nozzle of the plug insertion tool, turning to the right until it is locked by the pin inside the nozzle. Lubricate head of plug with rubber cement. Place plug head over puncture hole--holding lower end of metal tube to guide it and prevent bending--and push the entire metal tube into the puncture hole up to the base of the nozzle (fig. 19). Now press red spring stopper and squeeze the balance of cement into the tire (fig. 20). Retract metal tube with continuous clockwise turning and pulling action (fig. 21). Do not pull, but trim off excess of rubber plug protruding from puncture. The repair is now complete and the tire is ready for immediate use.

Fig. 16—Preparing Plug for Use

Fig. 17—Piercing Cement Cartridge

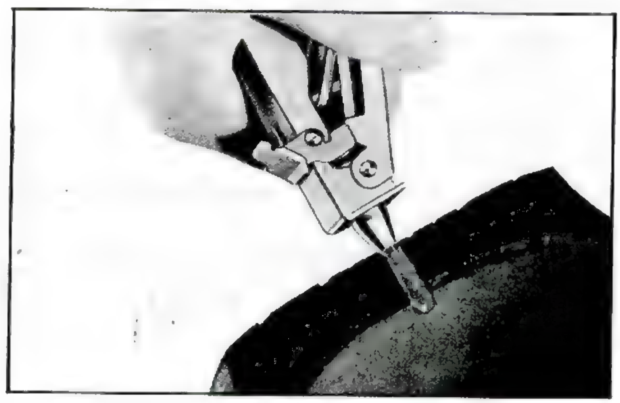


Fig. 18—Inserting Cement in Puncture

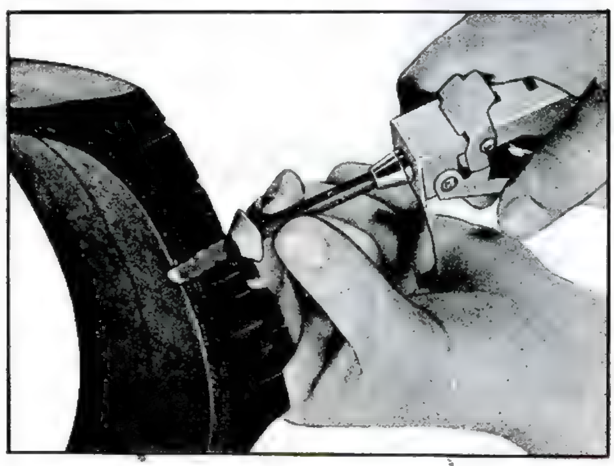


Fig. 19—Starting Plug into Puncture

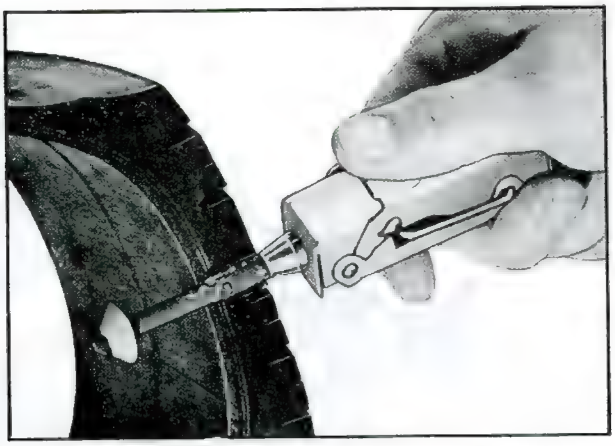


Fig. 20—Applying Remaining Cement with Plug Inserted

9. Clean your tools. Especially remove hardened rubber cement before using the plug-insertion tool for the next repair.

NOTE: If the puncture is an irregular cut that will not seal completely by this method, a self-vulcanizing patch or hot patch repair should be made.

WHEELS

Valve Assembly—Replace

NOTE: Always use new valve assembly when replacing.

1. Cut or drive old valve assembly out of rim.
2. Clean valve hole and surrounding area on inside of flange with steel wool.
3. Coat O.D. of new valve assembly liberally with the mounting compound.
4. Insert assembly through rim from inside. Snap into place, using a pair of slip-joint pliers with one jaw on rim and one jaw on base of valve assembly.

Repair

Rim

1. Straighten the rim if it is bent or dented.

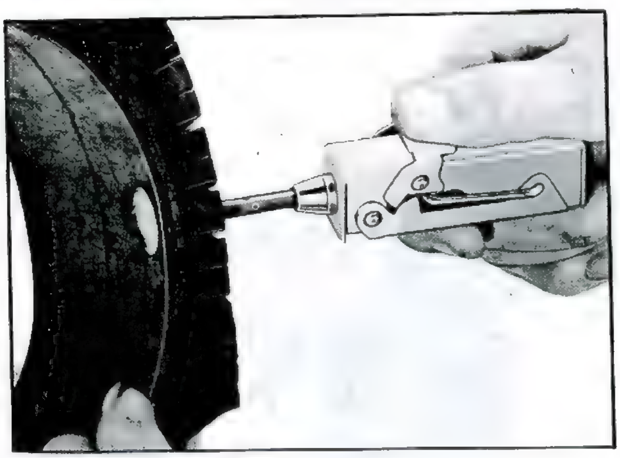


Fig. 21—Seating Plug to Complete Repair

Fig. 22—Installing Valve

2. Clean rim flange thoroughly with small piece of steel wool or sand paper.
3. Inspect the butt-weld in the rim flange area to make certain there is no groove or high spot (fig. 23). Any grooves or high spots must be filed flat and smooth.
4. If air loss occurs at valve it can be corrected by replacing valve core or valve assembly.

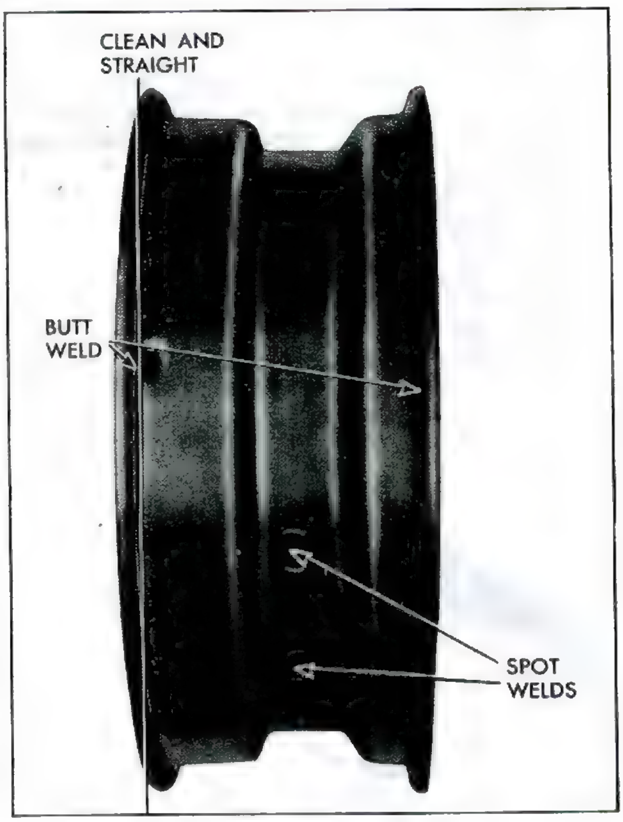


Fig. 23—Rim Inspection

SECTION 11
CHASSIS SHEET METAL
GENERAL DESCRIPTION

The chassis sheet metal for the Corvair consists of a rear (engine) grille and inserts and the underbody front and rear shields. The engine seals and shields are covered in Section 6.

COMPONENT PART REPLACEMENT

REAR ENGINE GRILLE AND INSERTS (Fig. 1)

Removal

1. Jack up front of car for easy access.
2. Remove screws from the underside of the grille.
3. Remove screws securing the sides of the grille (six places).
4. Remove six screws to disengage the inserts.

Installation

Reverse removal procedure.

UNDERBODY FRONT AND REAR SHIELDS (Fig. 2)

Removal and Installation

Remove all screws from the front shield first, then rear shield as shown in Figure 2. Install the rear shield first when replacing.

NOTE: Make certain all screws have been adequately torqued from 25 to 35 lbs. in. to eliminate the possibility of body noises.

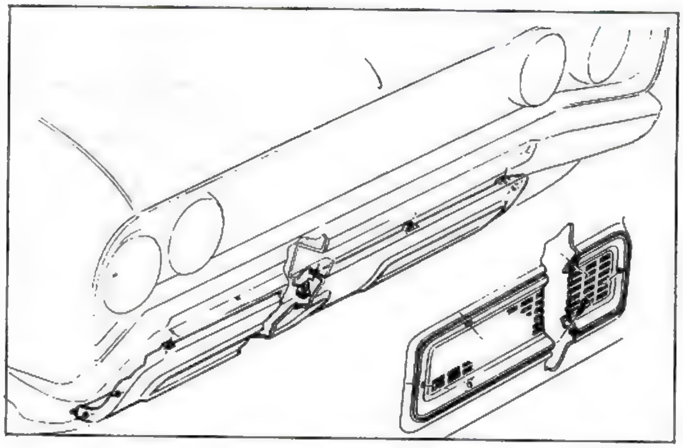


Fig. 1—Rear Engine Grille and Inserts

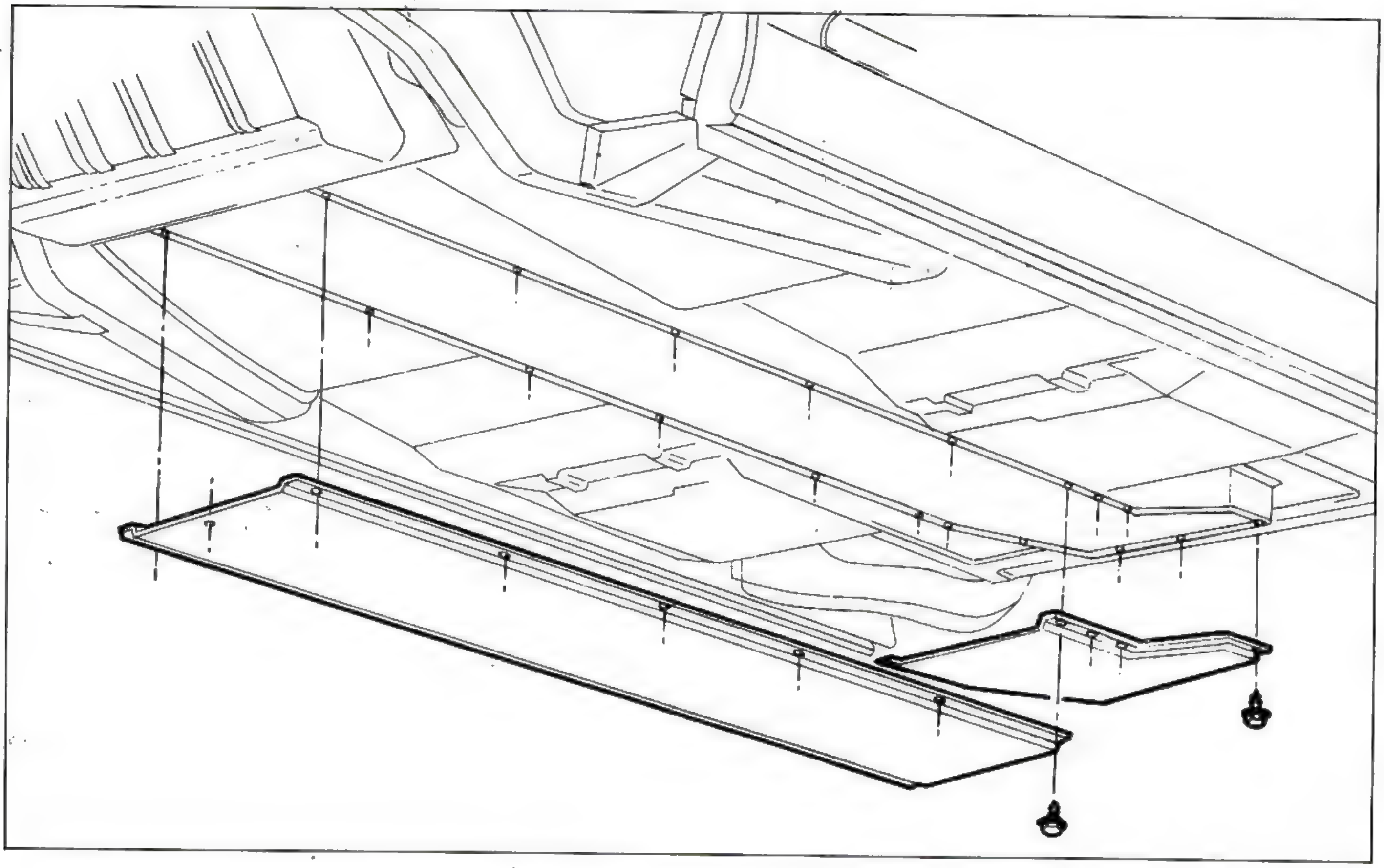


Fig. 2—Underbody Front and Rear Shields

SECTION 12
BODY AND CHASSIS ELECTRICAL

CONTENTS OF THIS SECTION

LIGHTING SYSTEM

INDEX

GENERAL DESCRIPTION

The lighting system includes the main lighting switch, stop light and dimmer switches, headlamps, parking lamps, stop, tail and directional signal lamps, instrument illumination and indicator lamps and the necessary wiring to complete the various circuits. A fuse panel provides convenient power take-offs and fuse clips for the appropriate circuits. Replacement of the headlamps, various other lamps and fuses should conform to the released specifications included at the end of this section.

MAINTENANCE AND ADJUSTMENTS

Maintenance of the lighting units and wiring system consists of an occasional check to see that all wiring connections are clean and tight, that the units are tightly mounted to provide a good ground, that the wiring is not pinched or damaged, and that the headlamps are properly adjusted.

SAFETY AIMER AND HEADLAMP ADJUSTMENT

Since the Corvair engine is located at the rear of the vehicle and the luggage compartment is forward of the passenger compartment, headlamp beam deflection which results from passenger and luggage loading is downward rather than upward as in the case of vehicles with front-mounted engines.

The T-3 Safety Aimer, Type B (fig. 2), consists of a circular base the size of a Corvair sealed beam unit (5-3/4" diameter) which attaches to the sealed beam unit by means of a plunger operated suction cup (An adapter converts the aimer for use with 7" T-3 Sealed Beam units when desired.) Attached to the front of the base and extending perpendicular to the base is an "L" shaped arm. When mounted on the sealed beam unit this arm points toward the center of the car and is parallel to the ground. Mounted in the arm between the base and cross arm is a bubble level which may be adjusted to compensate for variations in floor levelness. With the Safety-Aimer, the headlights may be correctly aimed in the daylight without even turning them on. The T-3 Aimer meets SAE specifications for mechanical headlamp aimers.

While aiming headlamps, car should be at curb weight, that is, with spare tire and filled to capacity with gas and oil but no passengers. Tires should be uniformly inflated to recommended pressure.

Before adjusting aim of headlamp bounce car up and down and roll the vehicle back and forth several times to allow suspension to settle. The floor should be reasonably level with enough room to walk around the car. If the area is level the T-3 Aimer can be used as it comes from the factory. Before the Aimer is packaged, the bubbles are set for use on level aiming space. The Aimer itself provides a means of checking any given area for levelness.

The following Corvair headlamp aiming procedures are based on a recommended "O" deflection from horizontal for the vertical aim. Where State laws require aiming other than that recommended here, follow the regulations of those States whenever adjusting headlamps.

HEADLAMP ADJUSTMENT—T-3 HEADLAMPS

The T-3 Safety Aimer—Type B (fig. 2), is used for the headlamp aiming description that follows.

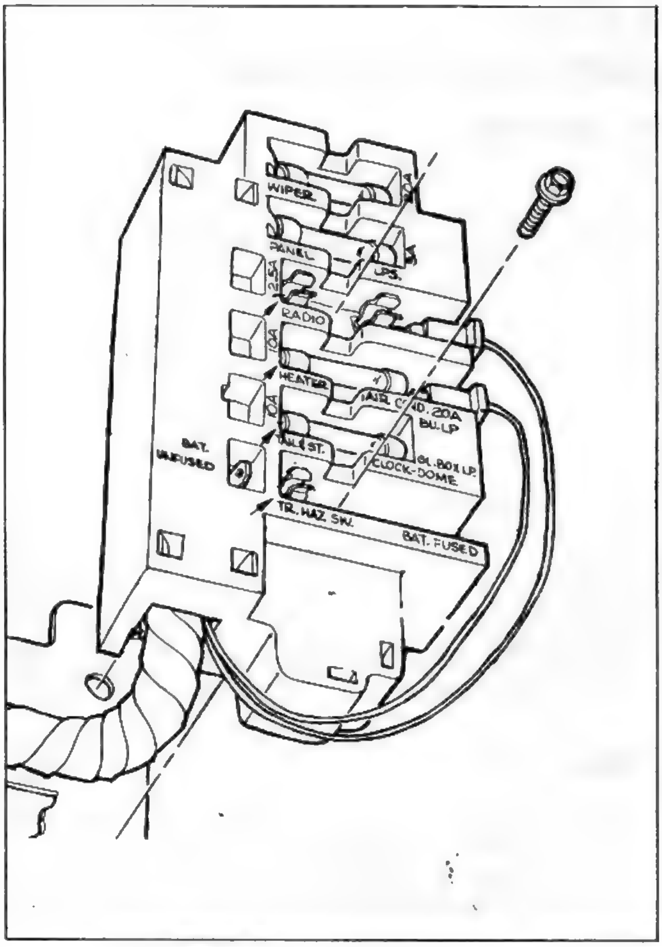


Fig. 1—Fuse Panel

1. Drive vehicle onto selected aiming area. Bounce vehicle several times and allow to settle.
2. Remove headlamp bezels.
3. Mount the T-3 Aimers on either the No. 1 or No. 2 pair of headlamps so that the points of the headlamps engage the smooth inner ring of the aimers.
4. Secure the aimers to the headlamp units by firmly pressing knob at center of each aimer (fig. 3). Rotate crossarms inboard to approximate horizontal position.

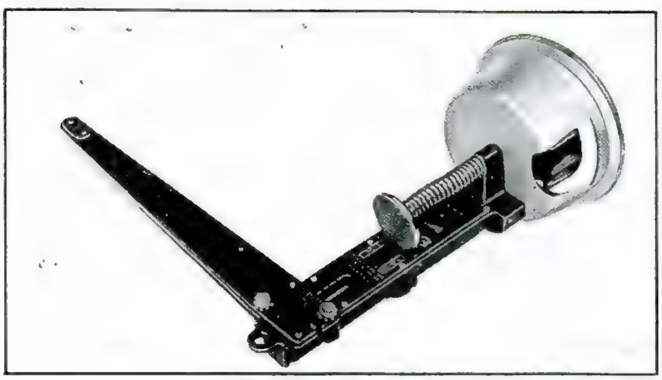


Fig. 2—T-3 Safety Aimer

NOTE: Moisten suction cups slightly to obtain maximum holding force.

5. With both aimers in place, knot both ends of elastic string and, using slots provided, fasten string across horizontal crossarms of each aimer.
6. Rotate both aimers so that the string just clears the points on the crossarms.

HORIZONTAL ADJUSTMENT

7. a. Turn horizontal aiming screw, Figure 4 on left-hand lamp until the string is positioned over the crossarm centerline. Turn the screw clockwise in making the final adjustment to take up play in the headlamp mechanism.
   b. Repeat the above procedure on the right-hand lamp to complete the horizontal adjustment of the headlamps.

VERTICAL ADJUSTMENT

8. a. Numeral "2" (fig. 5) should appear in the "down" window of each aimer. If not, loosen knob at underside of aimer arm and slide back and forth until the numeral does appear.

   NOTE: This setting will give a 2" drop of the headlamp high beam spot centerline on a screen placed 25 feet forward of the vehicle. Check state laws for proper vertical setting.

   b. Turn headlamp vertical aim screw (fig. 5) on left-hand unit counter-clockwise until the bubble is at the inner end of the glass tube. Then turn screw clockwise until bubble is centered in tube.
   c. Repeat this procedure on right-hand headlamp unit to complete vertical adjustment of lamps.
9. Recheck the string at the ends of each crossarm for correct setting and the bubble on each aimer for centered position.
10. Remove the aimers by pulling on the suction cup tabs through the openings in the aimers (fig. 6).
11. With headlamps properly aimed, replace headlamp bezels.

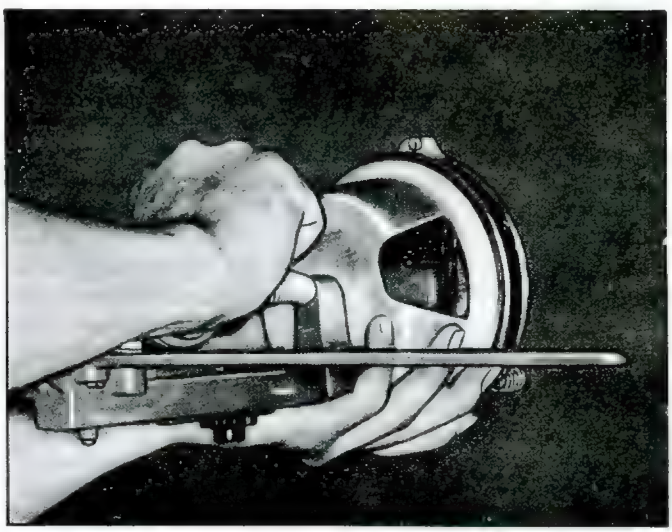


Fig. 3—Installing Aimer on Headlamp Unit

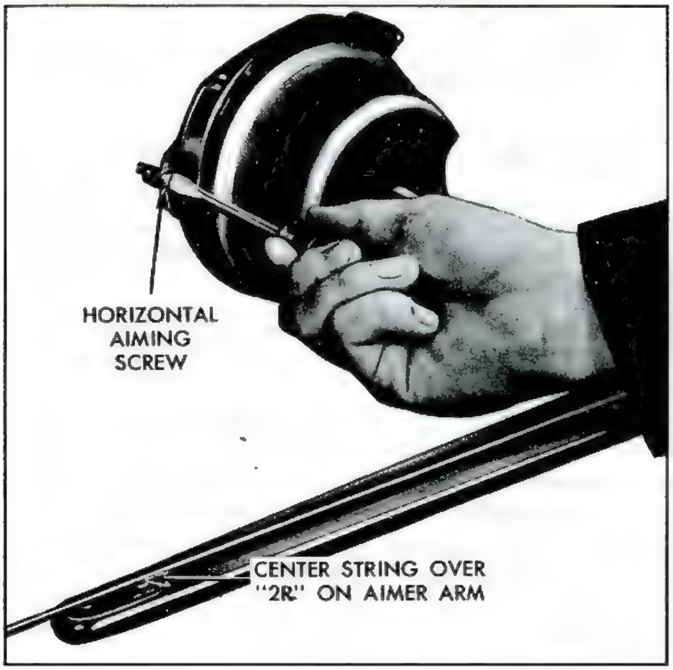


Fig. 4—Headlamp Horizontal Adjustment

T-3 AIMER CALIBRATION

HOW TO SELECT A LEVEL AIMING AREA

1. Select area you believe to be level.
2. Remove headlamp bezels and install Aimers on each headlamp (fig. 3) making sure aiming lugs engage smooth inner ring of the Aimer. To install Aimer, press firmly on the knob extending out from the center of the Aimer base. This forces the suction cup into place on the Sealed Beam unit.
3. Loosen the slider knob beneath the aimer arm and set the numeral "2" in the DOWN view window (fig. 7). Back vertical lamp adjuster out on each lamp until bubble is outside of black line of vial, then center bubble between black lines of vial by turning clockwise.
4. After both bubbles are centered, turn the car around end for end, making sure the tires rest in the spots made on the floor before the car was moved.
5. If the bubbles are still within the two outside black marks on the vials, the floor is level enough to use the Aimer as it comes from the factory.

NOTE: A quick level check can be made by using the T-3 Safety-Aimer as a level. Use with a true eight to ten foot two by four as an extension. Make sure pads on base of Aimer are used. Place the board where you expect the wheels to be and take readings as outlined above.

6. If either bubble moves outside the black lines of the vial there is too much slant to the floor. Try driving the car in at different angles onto the aiming area. If bubbles can not be centered follow procedure under "How to Compensate for Unlevel Floor."

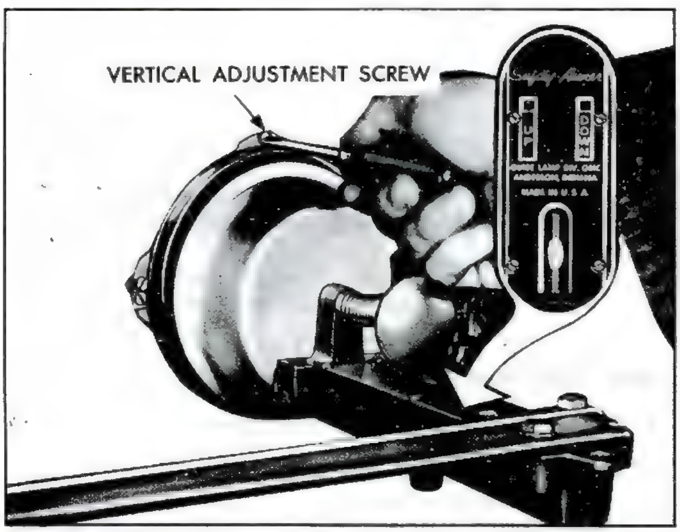


Fig. 5—Headlamp Vertical Adjustment

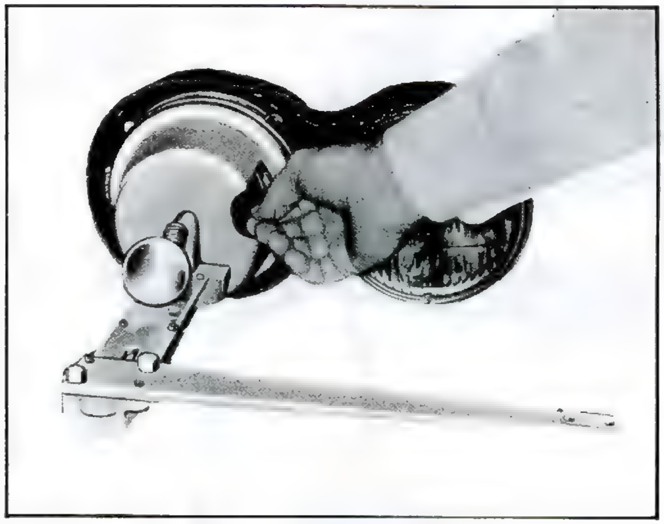


Fig. 6—Removing Aimer from Headlamp

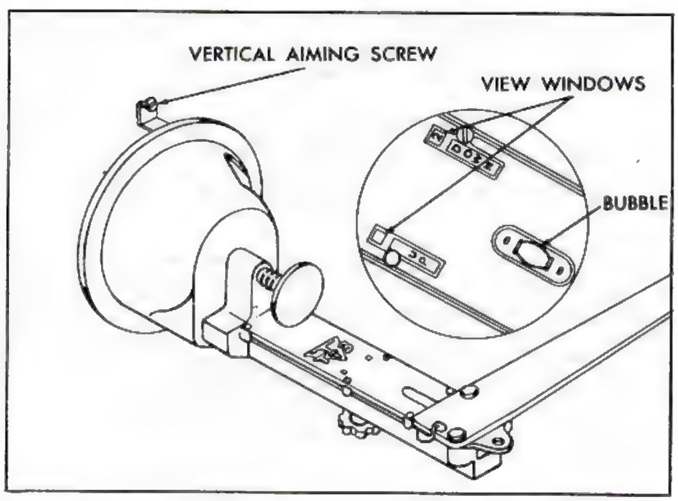


Fig. 7—Selecting Level Aiming Area

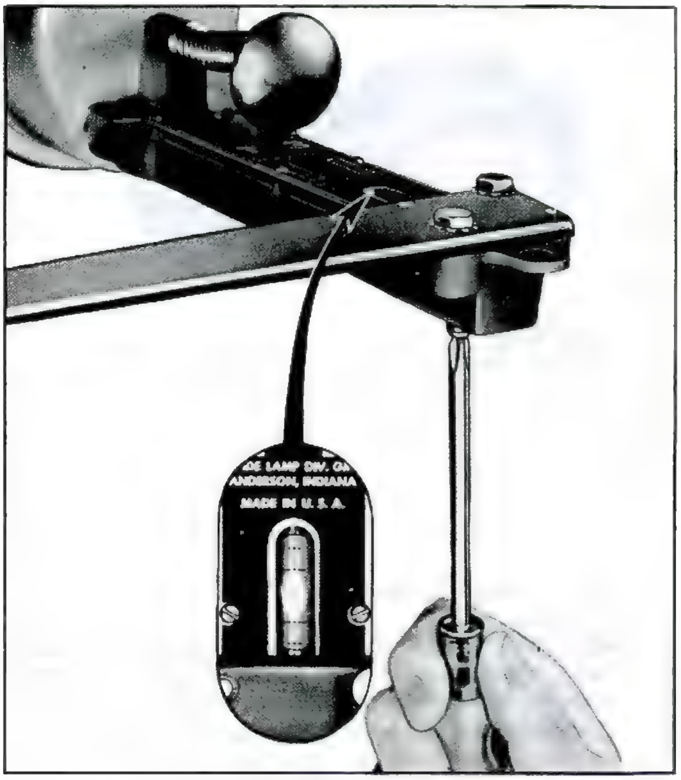


Fig. 8—Turning Level Adjusting Screw to Calibrate Aimer

NOTE: When level portion of floor is obtained, mark tire spots on floor so spots can be used next time without calibrating Aimer.

TO COMPENSATE FOR UNLEVEL FLOORS

If your floor is not level within the limits specified, the T-3 Aimer can be calibrated to compensate for the error in the floor. Follow this procedure with both aimers.

1. Drive the car onto the area for which you wish to compensate the aimers, and install the aimers in place on the headlamps.
2. Loosen knob beneath the aimer arm and move the slider until the bubble is centered.
3. Record the numeral in the view window. (This numeral is to be used only for recalibration.)
4. Move the slider to a position halfway between this recorded numeral and the numeral "2" in the DOWN window. (This numeral is used only in recalibration and not for headlamp aiming.)
5. Recalibrate aimers by turning screw shown in Figure 8 until the bubble is centered.
6. The T-3 Aimers are now calibrated for the selected area. All future aiming must be done in the same area and with the car pointed in the same direction. Mark the tire spots on the floor so that future cars can be located in the same position.

SERVICE OPERATIONS

SEALED BEAM REPLACEMENT

1. Remove headlamp bezel retaining screws and bezel (fig. 9).
2. Disengage retaining spring from unit (fig. 10). Turn lamp unit slightly to disengage unit from headlamp adjusting screws.

   NOTE: Do not disturb adjusting screw setting.

3. Pull headlamp unit forward and disconnect wiring harness connector from unit.
4. Remove retaining ring and headlamp from mounting ring.
5. Position new sealed beam unit in mounting ring and install retaining ring to unit.

   NOTE: The number molded into lens face must be at the top.

6. Attach wiring harness connector to new unit and install headlamp unit in sub body, twisting slightly to engage mounting ring tabs with adjusting screws.

   NOTE: In the dual headlight installation the inboard unit is No. 1, the outboard unit, No. 2. No. 1 unit takes a double connector plug, the No. 2 unit a triple connector plug.

7. Install retaining spring to mounting ring, check operation of unit, aim headlamps if necessary, and replace bezel.

PARKING LAMP SERVICE (Fig. 9)

Lense or Bulb Replacement

1. Remove two lense attaching screws and lense from housing.
2. Remove bulb and install replacement lamp.
3. Position lense to housing and install retaining screws.

Housing

1. Working inside the luggage compartment, remove cover plate in floor pan.
2. Remove attaching nut and "U" clamp at rear of housing.
3. Disconnect wiring at rear of lamp socket.
4. Position housing to body and install clamp and retaining nut.
5. Connect wiring to lamp socket and install lamp.
6. Check operation and install cover plate.

LIGHTING SWITCH REPLACEMENT (Fig. 11)

1. Disconnect ground cable from battery.
2. Pull knob out to headlamp "ON" position.
3. Reach under the instrument console and depress the switch shaft retainer (fig. 11). With retainer depressed pull knob and shaft assembly from the switch.

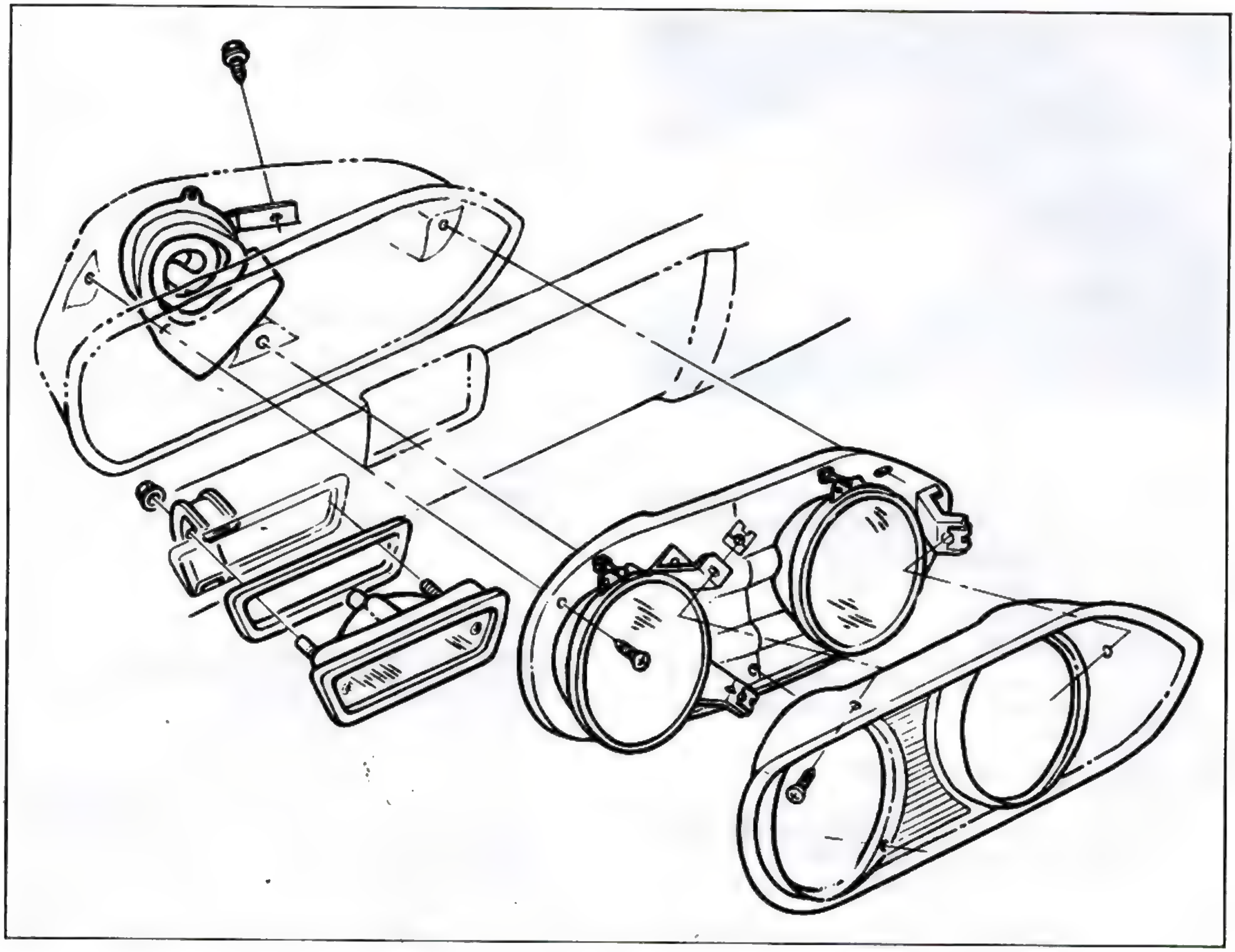


Fig. 9—Headlamp, Parking Lamp and Horn Assemblies

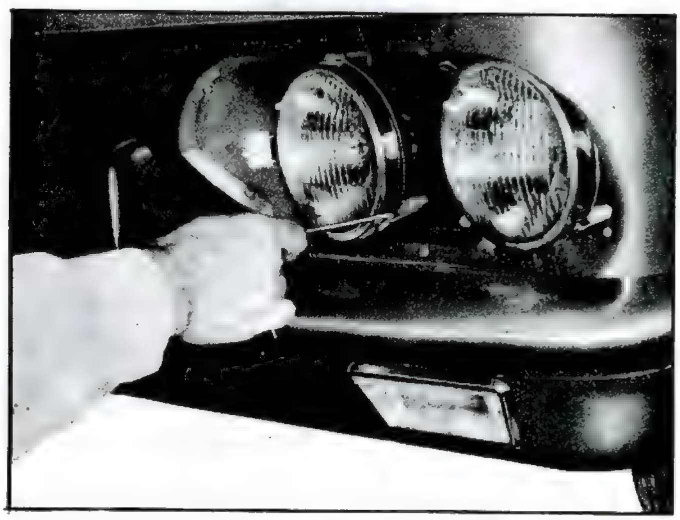


Fig. 10—Removing Retaining Ring Spring

4. Remove the switch bezel nut using Tool J-21932 (fig. 12).
5. Remove the retaining ferrule nut using Tool J-4880, then lower the switch assembly.

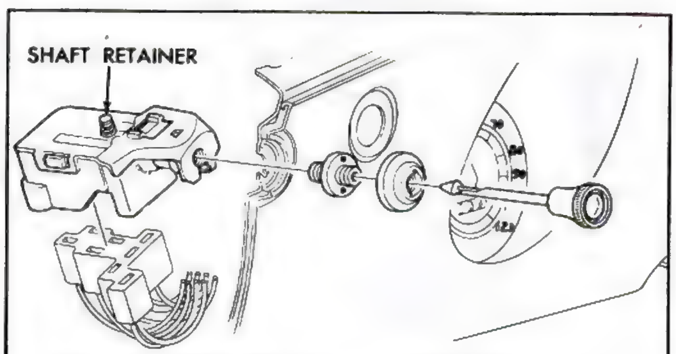


Fig. 11—Lighting Switch Installation

Fig. 12—Removing Bezel Nut

6. Disconnect the multi-plug connector from the lighting switch. A screw driver may be inserted in the side of the switch to pry the plug from the switch.
7. Connect the multi-plug connector to a new switch.
8. Position the switch in the console and install the retaining ferrule nut.
9. Install the bezel nut.
10. Push the switch knob and shaft assembly into position so that it engages the shaft retainer.
11. Connect the battery ground cable and check operation of lights.

STOPLIGHT SWITCH REPLACEMENT (Fig. 13)

1. Disconnect the two connectors from the switch terminals. The switch is located under the instrument panel adjacent to the brake pedal.

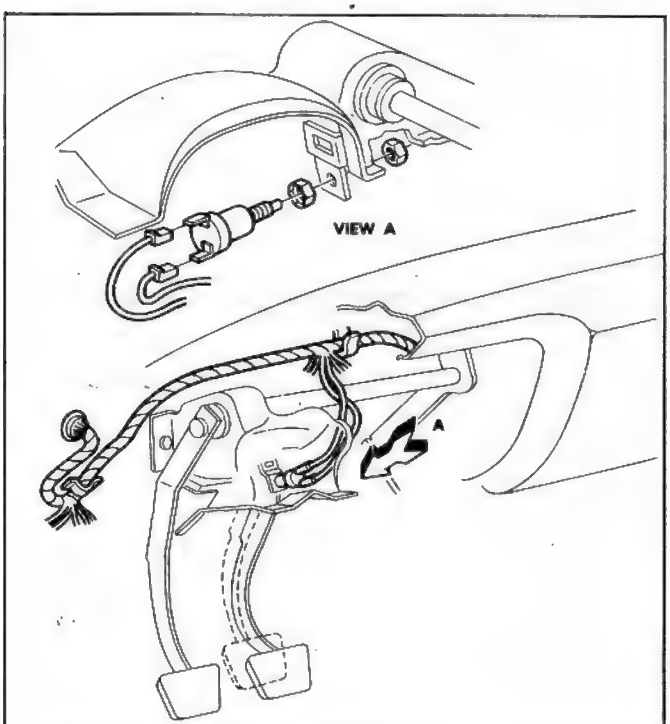


Fig. 13—Stoplight Switch Installation

2. Remove the locknut from the plunger end of the switch and remove switch from bracket.
3. Remove second locknut from switch and install on the new switch.
4. Position the switch in the bracket and install the remaining locknut.
5. Install the two electrical connectors.
6. Check operation of switch and adjust as required. Electrical contact should be made when the brake pedal is depressed .38 to .50 inch from fully released position.

DIMMER SWITCH REPLACEMENT (Fig. 14)

1. Lift interior floor mat.
2. Remove the multiple connector from the switch.
3. Remove the two screws securing switch to floor pan and remove switch.
4. Install multiple connector to new switch.
5. Secure switch to floor pan with the two attaching screws.
6. Replace floor mat and check operation of switch.

WINDSHIELD WIPER SWITCH REPLACEMENT (Fig. 15)

1. Disconnect battery ground cable from battery.
2. Loosen the small set screw at the bottom of the wiper arm and remove knob.
3. Remove bezel using Tool J-21932.
4. Remove the locking nut and washer.
5. Withdraw wiper switch from instrument panel and remove the connector from the rear of the switch. A single unit is used on units without windshield washers. Two connectors are used on units with windshield washers.
6. Attach wiring connectors to new switch, set switch in place, and install ground washer and locknut.
7. Install bezel using Tool J-21932.
8. Set knob in place and secure with set screw.
9. Connect battery ground cable to battery and check operation of switch.

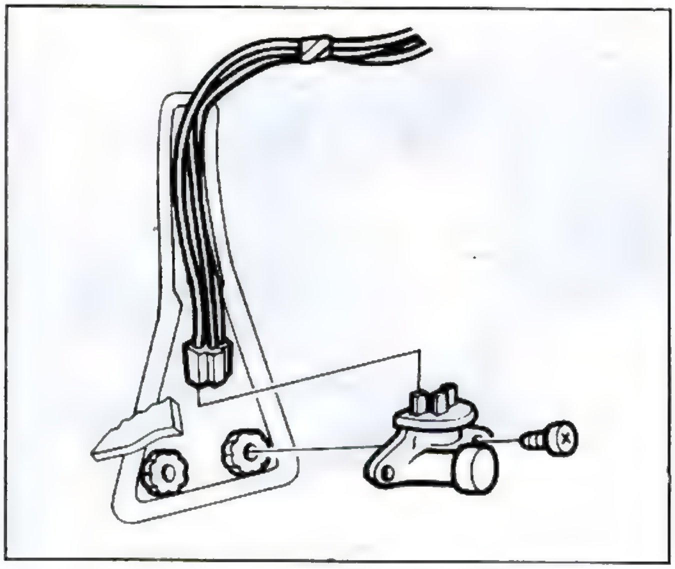


Fig. 14—Dimmer Switch Installation

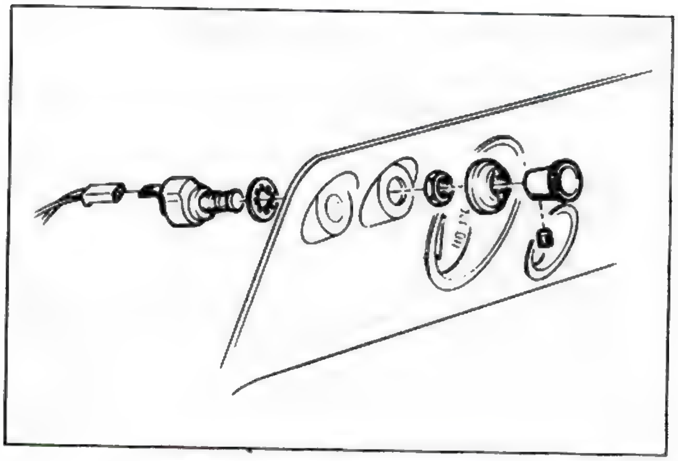


Fig. 15—Windshield Wiper Switch Installation

NEUTRAL SAFETY SWITCH REPLACEMENT (Fig. 16)

1. Disconnect the battery ground cable.
2. Remove instrument cluster assembly from vehicle.
3. Remove the retaining ring securing the switch lever arm to range selector assembly.
4. Remove the two screws that attach the switch to the range selector assembly.
5. Lower the switch and disconnect the wiring harness connectors from the switch terminals.
6. Install wiring harness connectors onto new switch.
7. Extend plunger in switch to its outer most position and insert gauge block in switch case.
8. Position switch plunger pin to the range selector assembly and loosely install the two attaching screws.

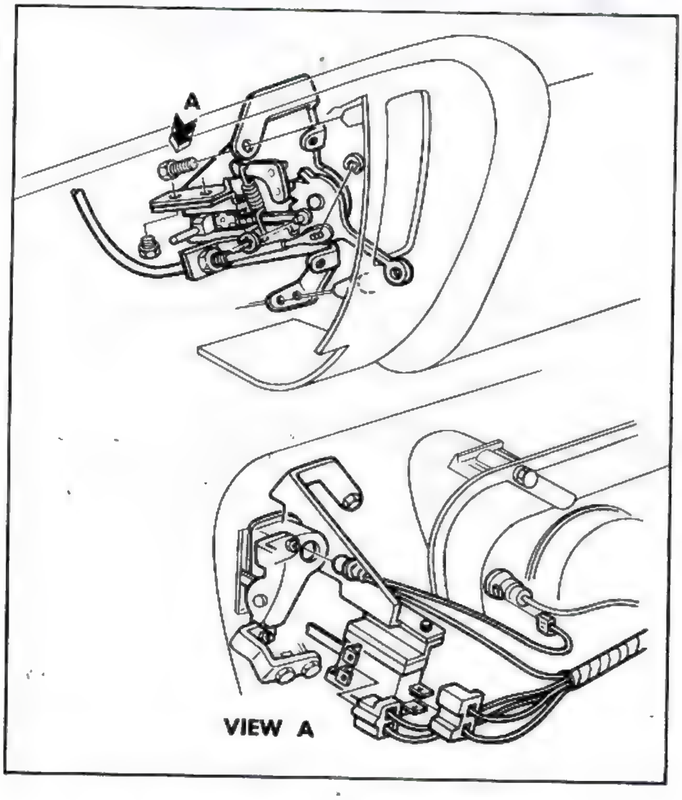


Fig. 16—Neutral Safety Switch Installation

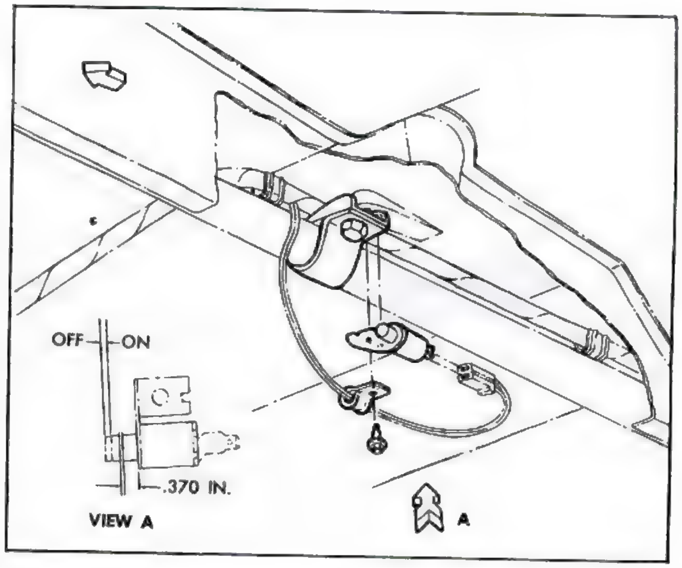


Fig. 17—Backing Lamp Switch—3-Speed Transmission

9. Install the retainer securing the plunger pin to the selector assembly.
10. Place transmission range selector into "N"-neutral position.
11. Push forward on switch case until contact carrier is against gauge block.
12. Tighten switch attaching screws and remove gauge block.
13. Test operation of switch. Engine must start in "N"-neutral position only. Check operation of backing lamps if so equipped.

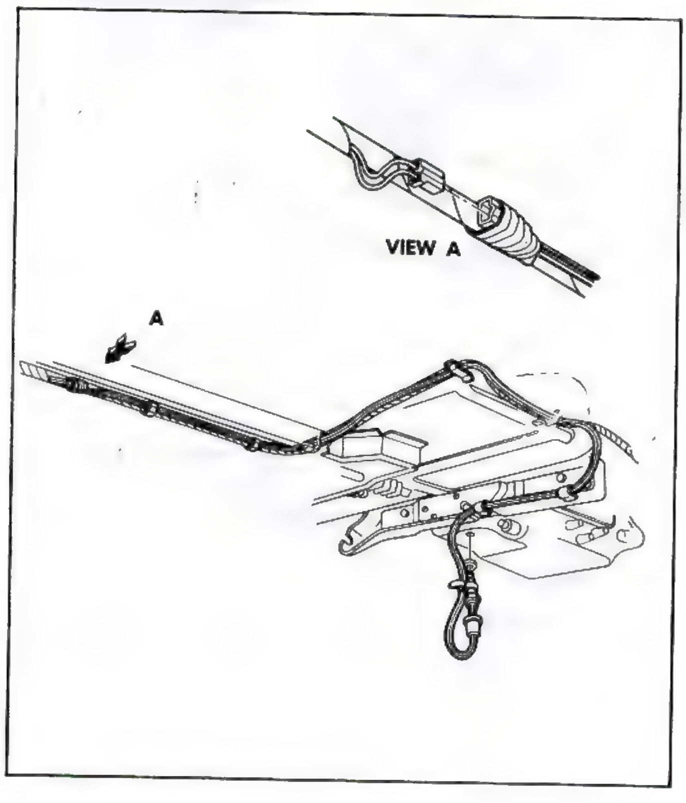


Fig. 18—4-Speed Transmission Backing Lamp Switch

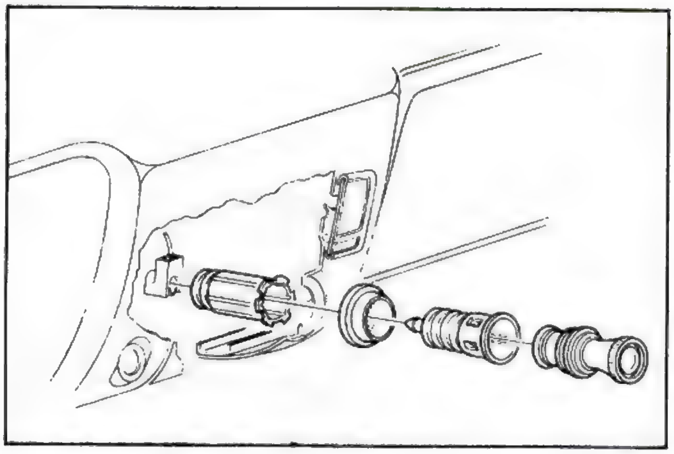


Fig. 19—Cigarette Lighter Installation

BACK-UP LAMP SWITCH REPLACEMENT

3-Speed Only (Fig. 17)

1. Remove the underbody tunnel front cover attaching screws and withdraw cover.
2. Remove the connector from back of switch. Remove the metal screw that attaches switch to underbody and withdraw switch.
3. Plug connector into switch and secure switch onto underbody.
4. Position the gearshift lever in reverse. Adjust striker on shifter tube so that tang pushes plunger into switch body. The distance between switch and tang on striker should be 3/8".
5. Check operation of switch before replacing tunnel front cover.

4-Speed Transmission (Fig. 18)

1. Raise and support vehicle.
2. Remove underbody tunnel cover.

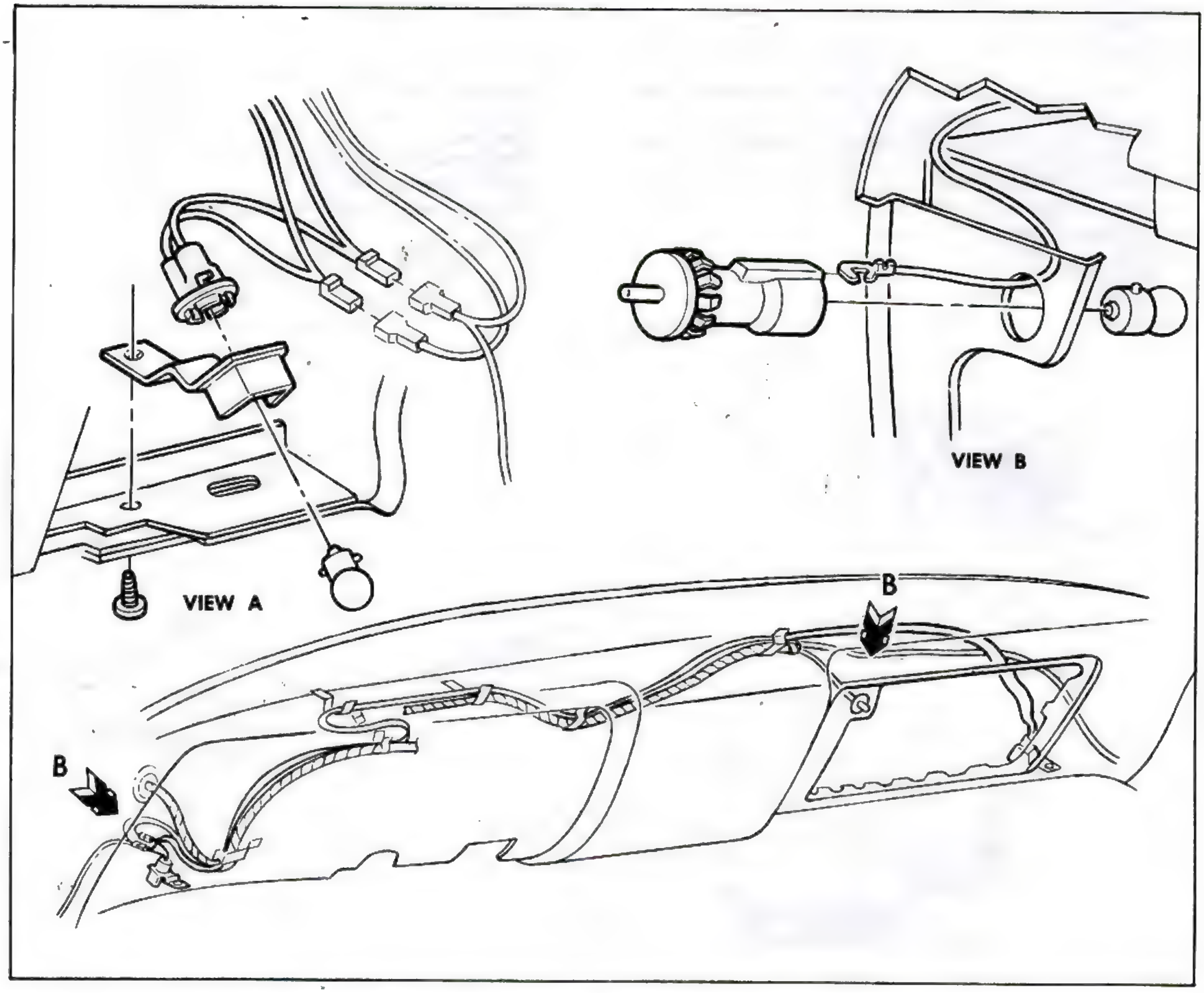


Fig. 20—Instrument Panel Compartment and Courtesy Lamps

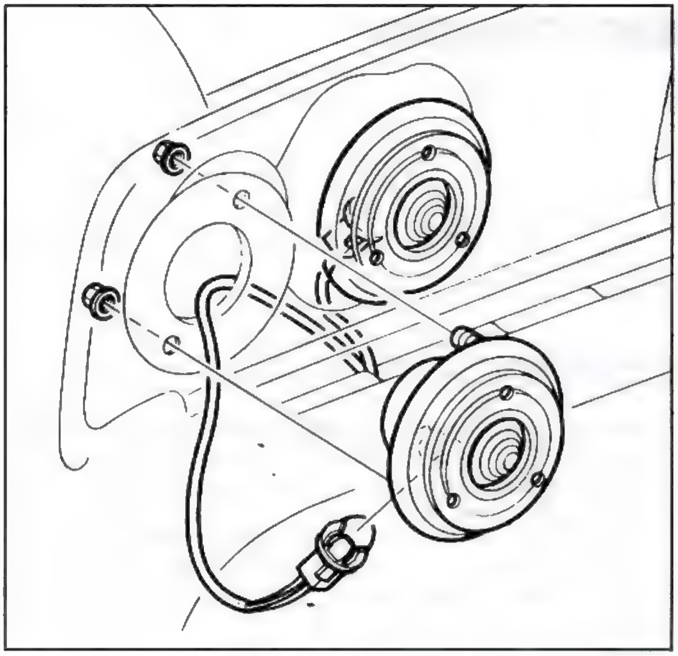


Fig. 21—Rear End Lighting

3. Untape switch wire from body wiring harness and separate switch wiring connectors.
4. Disconnect switch wiring from body attaching clips and remove switch assembly from transmission.
5. Install new switch assembly and gasket in transmission.
6. Route switch wire assembly through body attaching clips and connect to forward wiring connector.
7. Tape switch wire to body wire harness.
8. Install underbody tunnel cover.
9. Lower vehicle and check operation of switch.

CIGARETTE LIGHTER REPLACEMENT (Fig. 19)

Replacement

1. Disconnect terminal at rear of unit under panel.
2. Remove retainer from rear of housing under the instrument panel.
3. Remove knob, housing and bezel from panel opening.
4. To install position housing and bezel to panel opening, then attach retainer to rear of housing.
5. Connect wire lead to rear of housing and insert knob assembly into housing. Check operation of unit.

INSTRUMENT PANEL COMPARTMENT LAMP

Bulb or Switch Replacement (Fig. 20)

1. Reach into panel compartment, depress bulb in end of switch, and turn it counter-clockwise. Remove bulb.
2. Push switch out of mounting hole. Carefully pull wire and terminal out of switch. If terminal is not removable cut switch wire.
3. Insert wire and terminal into new switch. Splice wire if cut during removal.
4. Push switch into place and install bulb by setting it in place, depressing and turning it clockwise.

COURTESY LAMP REPLACEMENT (Fig. 20)

1. Unsnap lamp socket from mounting bracket.
2. Remove bulb from socket and insert new bulb.
3. Snap lamp socket into mounting bracket.

TAIL, STOP, DIRECTIONAL AND BACKING LAMPS (Fig. 21)

To Replace Bulb

1. Unsnap bulb socket from underside of lamp housing in engine compartment.
2. Remove bulb and install new bulb into socket.
3. Snap socket into lamp housing and check operation of lamp. Close engine compartment.

To Replace Housing

1. Unsnap socket from housing inside engine compartment.
2. Remove retaining nuts from housing bolts and detach lamp housing assembly from body.
3. Position new lamp housing assembly to body and install retaining nuts.
4. Snap bulb in place and check operation of lamp.

To Replace Lens

1. Remove lens retaining screws and carefully detach lens from lamp housing.
2. Position new lens to housing and install retaining screws.

LICENSE PLATE LAMP REPLACEMENT (Fig. 22)

1. Remove lens retaining screws and lens.
2. Disengage bulb from socket.
3. Replace bulb, position lens and install retaining screws.

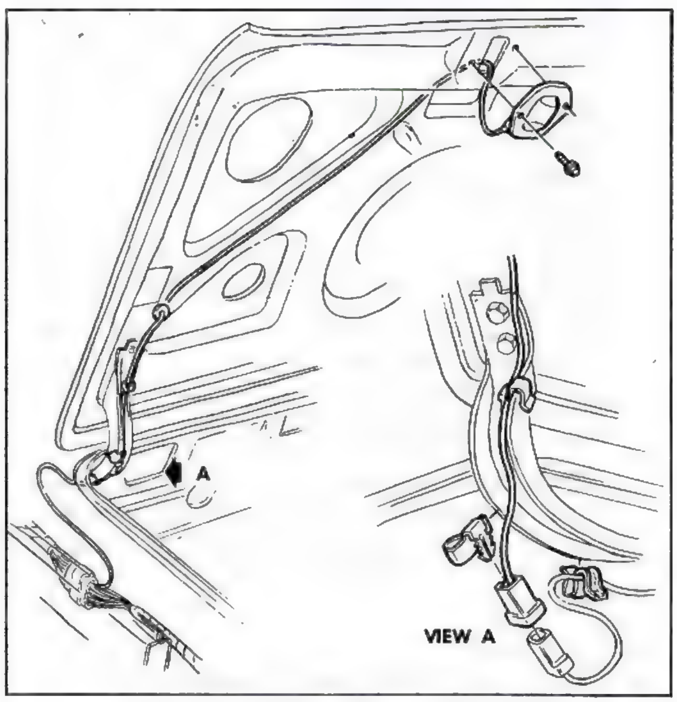


Fig. 22—License Plate Lamp

INSTRUMENTS AND GAUGES

INDEX

GENERAL DESCRIPTION

All Corvair instrument, gauges or indicators are located in the console mounted instrument cluster (fig. 23). The entire cluster must be removed to permit servicing of the various instruments and gauges.

The cluster illuminating and indicator bulbs may be replaced without removing the cluster from the console. However, it is necessary to remove the heater control assembly or if so equipped, the air conditioning control assembly. The indicator or cluster illuminating lamp sockets may then be snapped in or out of position.

Regular maintenance is not required on the instrument cluster or its components other than maintaining clean, tight electrical connections, replacing defective parts and keeping the speedometer cable properly lubricated.

The instrument cluster used with the high performance engines has in addition to the standard Corvair engine warning lights, a cylinder head temperature gauge and an engine overheat warning buzzer.

The gauge indicates cylinder head temperat .e any time the ignition switch is "ON". Should the engine overheat, the "TEMP-PRESS" light and the buzzer will operate.

NOTE: If oil pressure is low, only the "TEMP-PRESS" light oprates. If the engine temperature is too high, both the light and the buzzer operate. THIS IS THE POSITIVE WARNING SYSTEM.

SERVICE OPERATIONS

INSTRUMENT CLUSTER

REMOVAL (Fig. 23)

1. Disconnect battery ground cable.
2. Remove steering wheel and mast jacket assembly (Refer to Steering, Section 9).
3. Remove light and wiper switch bezel nuts using Tool J-21932.

   NOTE: On Powerglide models remove shift lever knob.

4. Remove heater or air conditioning control retaining screws and allow control to hang below instrument console.
5. Disconnect speedometer cable at rear of speedometer housing. If so equipped, disconnect trip odometer.
6. Remove screws retaining instrument cluster assembly to console (fig. 24).
7. Pull instrument cluster assembly forward from console and disconnect cluster wiring harness from panel wiring harness at multiple disconnect (fig. 23).

   NOTE: On Powerglide models, remove shift lever mechanism from rear of cluster housing.

8. Remove cluster from the console completely and transfer to a suitable bench area for repair operations.

INSTALLATION

1. Position instrument cluster assembly to console.

   NOTE: On Powerglide models attach shift lever mechanism to cluster assembly.

2. Connect cluster wiring harness to instrument panel wiring harness (fig. 23).
3. Install screws retaining cluster assembly to console.
4. Connect speedometer cable to rear of speedometer housing (connect trip odometer, if so equipped).
5. Position heater control to cluster and install retaining screws.
6. Install light and wiper switch bezel retaining nuts. On Powerglide models, also install shift lever knob.
7. Install mast jacket and steering wheel assemblies.
8. Connect battery ground cable and check operation of cluster assembly.

TACHOMETER

The tachometer is a self-contained, all transistor unit requiring no external relays or batteries and very little service other than keeping the terminal nuts clean and tight.

TEMPERATURE GAUGE

The manifold temperature gauge requires very little servicing other than testing for malfunctioning, keeping the connections clean and tight and replacing defective units.

OIL PRESSURE SENDING UNIT

Replacement

1. Disconnect wire lead at switch terminal (located at top of oil filter bracket).
2. Remove sending switch using Tool J-21757 (fig. 25).
3. Install new switch and reconnect wire lead to terminal.

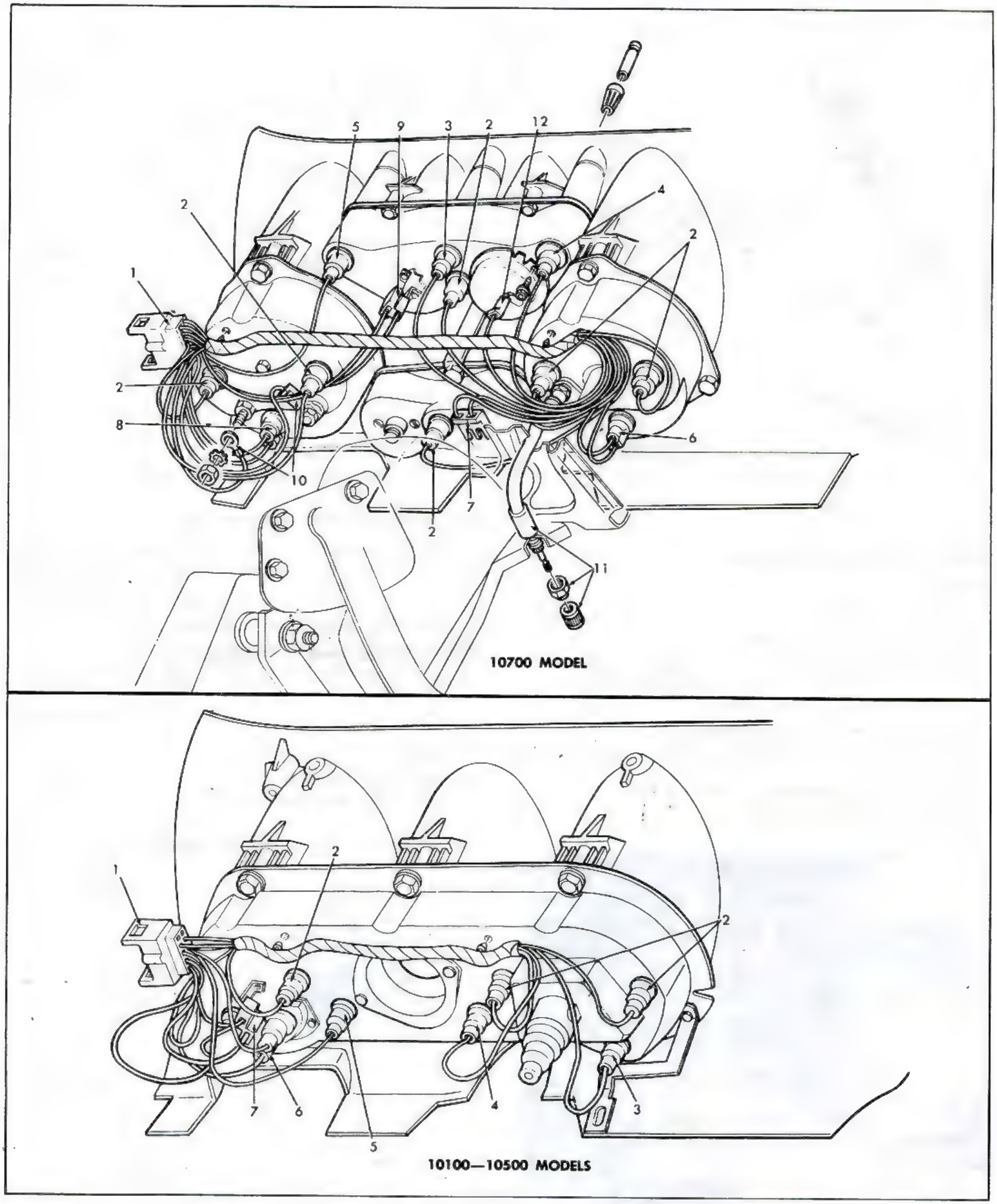


Fig. 23—Instrument Cluster Assemblies

1. To Instrument Panel Harness
2. Instrument Cluster Bulb
3. Hi-Beam Indicator
4. L.H. Direction Indicator
5. R.H. Direction Indicator
6. Gen/Fan Indicator
7. Fuel Gauge
8. Temp/Press Indicator
9. Manifold Temp. Gauge
10. Tachometer
11. Trip Odomete
12. Clock

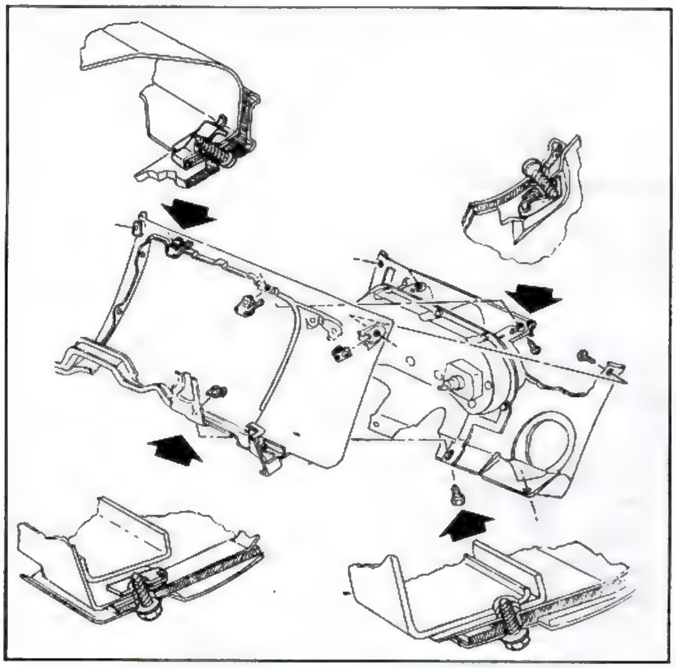


Fig. 24—Instrument Cluster Attachment

TEMPERATURE SENDING UNIT

Replacement

1. Remove engine lower right shroud to gain access to the engine temperature sending unit.

   NOTE: On high performance engines remove lower left shroud to gain access to the cylinder head temperature sending unit.

2. Disconnect the wire connector at the switch terminal.
3. Using a 1-1/16", 6 point deep well socket remove the sending unit.
4. Install new switch and connect wire lead to terminal.
5. Replace engine lower shroud.

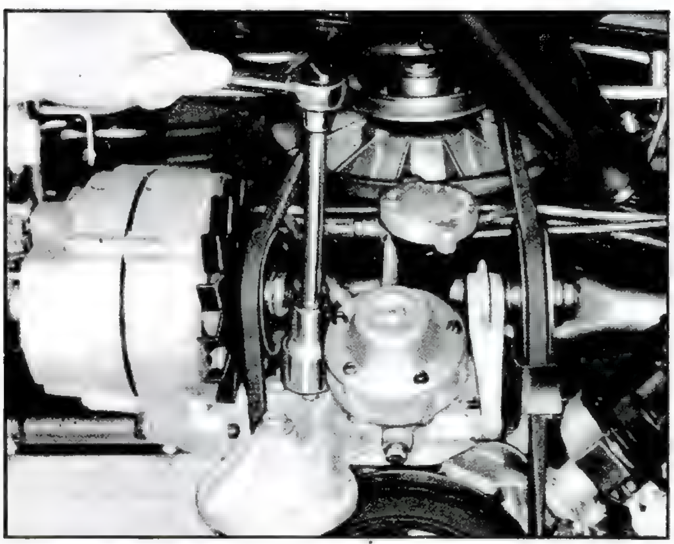


Fig. 25—Oil Pressure Sending Unit Removal

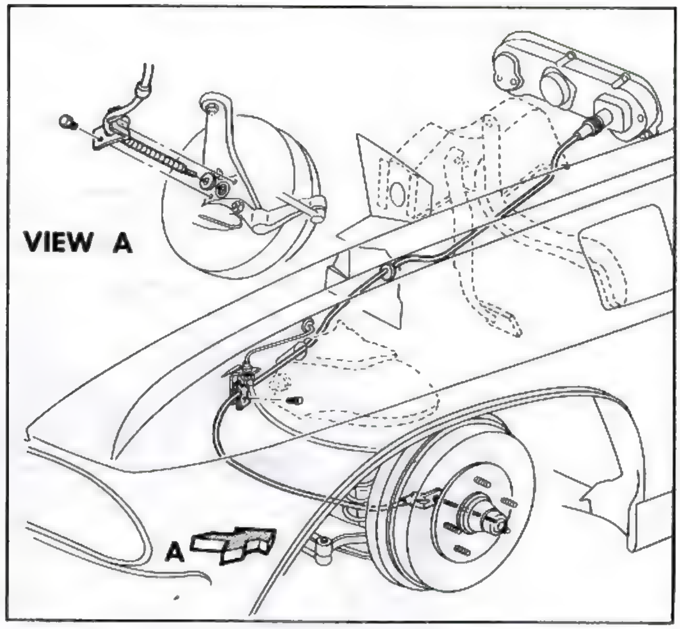


Fig. 26—Speedometer Shaft Assembly

SPEEDOMETER SERVICE (Fig. 26)

The speedometer head requires comparatively little service and as special equipment is required, servicing of the unit should be performed by an authorized AC speedometer service station. Cluster must be removed to service the speedometer head assembly.

Cable Replacement or Lubrication

1. Disconnect the speedometer cable retaining collar at the rear of the speedometer head.
2. Remove the cable by pulling it out from the speedometer head of the conduit.

   NOTE: If old cable is broken it may be necessary to disconnect the cable assembly at the rear of the left front spindle.

3. Lubricate the lower 3/4 of cable with a suitable lubricant and push the cable into the conduit.

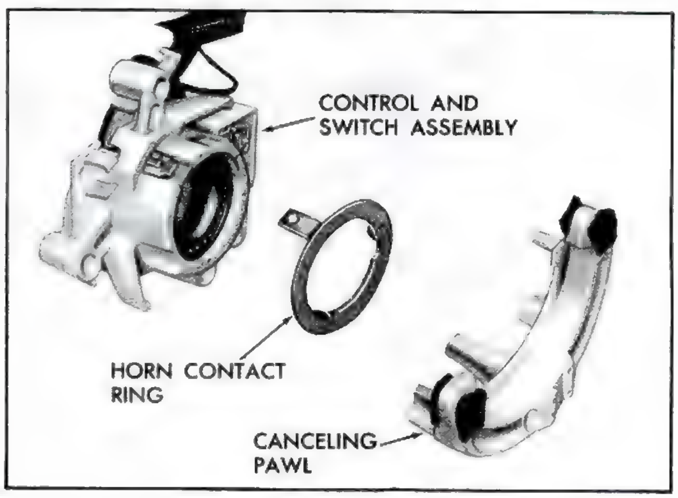


Fig. 27—Direction Signal Control

NOTE: Do not over-lubricate. Apply only a thin film of lubricant.

4. Connect upper end of conduit to the speedometer head. Install lower cable assembly if previously detached.
5. Road test vehicle and check speedometer operation.

HORN

Replacement (Fig. 9)

1. Remove headlamp bezel
2. Remove screws retaining the headlamp and sub-body assembly to the body panel.
3. Carefully remove assembly from opening and disconnect wiring at rear of headlamps.
4. From inside of luggage compartment remove bolt retaining horn unit to the headlamp panel.
5. Disconnect wire lead from horn and remove horn from the opening.
6. Connect wire lead to new horn position unit to the panel and install the retaining bolt.
7. Check operation of the unit, then install headlamp and sub-body assembly to body opening.
8. Install headlamp bezel.

DIRECTIONAL SIGNAL

The Corvair uses a new design directional signal assembly (fig. 27). The switch mechanism is an electrically operated self-contained unit having the cancelling mechanism and the electrical switching in one plastic assembly.

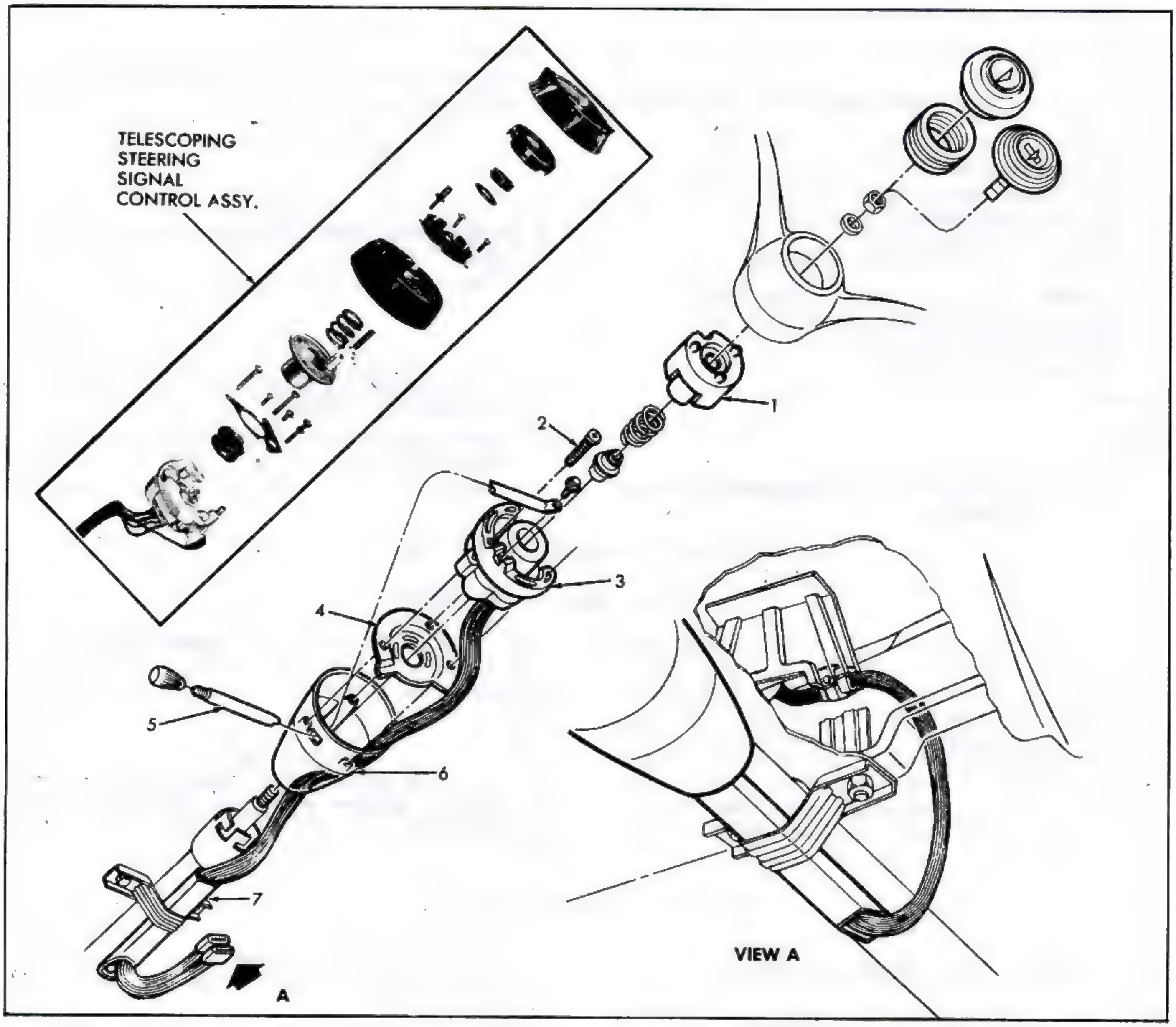


Fig. 28—Directional Signal Assemblies

1. Canceling Cam
2. Attaching Screw
3. Control and Switch Assembly
4. Retaining Plate
5. Lever
6. Housing
7. Wiring Harness Cover

The directional signal control is one complete plastic assembly using a stamped bowl instead of an integral cast bowl. The bowl serves only as a housing.

ADJUSTMENTS

The directional signal mechanism requires no adjustments due to its simplicity of design. However, if any malfunction of this mechanism should occur, the steering wheel may be removed and the mechanism checked for defective parts.

REMOVAL AND INSTALLATION (Fig. 28)

Standard Models

1. Disconnect battery ground cable.
2. Remove steering wheel assembly (Refer to Section 9, Steering).
3. Disconnect signal control wiring assembly at harness quick disconnect.
4. Remove steering column mast jacket upper support clamp.
5. Remove directional signal lever and three screws attaching control assembly to the retaining plate.
6. Remove directional signal control assembly retaining plate and signal housing from steering column, disengage wiring from housing.
7. To install, reverse removal procedures.

CAUTION: Direction signal control assembly must be in neutral position when assembling steering wheel to prevent damage to cancelling cam and control assembly.

Telescoping Steering Wheel (Fig. 28)

Removal

1. Disconnect battery ground cable.
2. Remove steering wheel and hub assembly as outlined in Section 9, Steering.
3. Remove spring and cancelling cam from steering shaft.
4. Remove turn signal lever retaining screw and lever.
5. Remove the three screws retaining directional control to the retaining plate.
6. Remove wiring clamp and cover from directional signal wiring harness.
7. Remove the wire terminals from the plastic connectors using a small, thin bladed screw driver.

NOTE: To facilitate reassembly, record the color code of the wires.

8. Guiding the wiring, carefully pull the directional signal switch out of the housing.

Installation

1. Position directional signal switch into housing being careful to properly route wiring through guide in housing.
2. Install retaining plate and control retaining screws.
3. Install direction signal wiring cover over harness and slide it up into place in the housing guides.
4. Engage wiring clamp tang in mast jacket hole and secure with retaining screw.
5. Install wiring terminals into plastic connectors and connect to body wiring harness.
6. Position directional signal lever and install retaining screw.
7. Place cancelling cam and spring into position on steering shaft.

CAUTION: Direction signal control assembly must be in neutral position when assembling steering wheel to prevent damage to cancelling cam and control assembly.

8. Install steering wheel and hub assembly as outlined in Section 9, Steering.
9. Connect battery ground cable and check operation of unit.

WINDSHIELD WIPER

GENERAL DESCRIPTION

The regular production, single-speed electric windshield wiper assembly available on the 1965 Corvair incorporates a non-depressed type (blades park approximately 2" above windshield molding) motor and gear train. The rectangular, 12 volt, shunt wound motor is coupled to a gear train consisting of a helical drive gear at the end of the motor armature shaft, an intermediate gear and pinion assembly, and an output gear and shaft assembly. The crank arm is attached to the output gear shaft.

The optionally available two-speed, non-depressed wiper and washer assembly incorporates a rectangular, compound wound (series and shunt field) motor adapted to the same type gear train as that used with the new single-speed wipers.

Two switches, connected in parallel, control the starting, stopping an parking of both types of wiper motors. The manually operated start, stop switch is located on the dash panel, while the cam operated park switch is located in the wiper gear box.

SERVICE OPERATIONS

WIPER TRANSMISSION ASSEMBLY

REMOVAL AND INSTALLATION (Fig. 29)

1. Make certain motor is in park position, remove wiper arm and blade assemblies from transmission shaft.
2. Remove plenum chamber grille.
3. Loosen nuts retaining drive link to crank arm ball joint and disconnect drive link from crank arm (View B, fig. 29).
4. Remove transmission retaining screws, lower assembly into plenum chamber and remove complete unit from the chamber.
5. To install, reverse removal procedure and check operation of unit.

WIPER MOTOR ASSEMBLY

REMOVAL AND INSTALLATION (Fig. 29)

1. If possible, place motor in park position and disconnect battery ground cable.
2. Remove wiper blade and arm assemblies.
3. Remove plenum chamber grille.
4. Loosen nuts retaining drive arm to crank arm ball stud (View B, fig. 29).
5. Disconnect all wiring and washer hose connections at the motor and pump assembly.
6. Remove bolts retaining motor to firewall while supporting the motor assembly and remove motor from vehicle.
7. To install, check sealing gasket and bolts, then position motor to the firewall and install retaining bolts.
8. Attach drive link socket to crank arm ball joint and tighten nuts.
9. Install plenum chamber grille.
10. Install wiper blade and arm assemblies.
11. Connect all wiring connection and washer hoses.
12. Connect battery ground cable and check operation of unit.

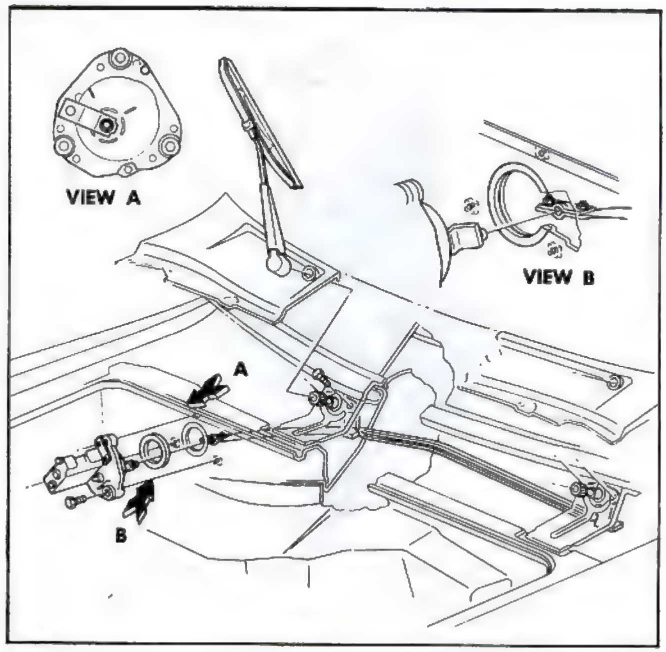


Fig. 29—Windshield Wiper Assembly

DISASSEMBLY

Gear Box

Refer to Figure 30 for explode of motor and gear train.

1. Clamp crank arm in a vise and remove crank arm retaining nut.

   NOTE: Remove washer pump assembly and washer drive cam on wipers so equipped. Drive cam can be pried off using suitable tool (fig. 31).

2. Remove crank arm, seal cap, Tru-Arc retaining ring, flat washer and shims where applicable.
3. Drill out gear box cover retaining rivets, remove cover from gear train.

   NOTE: Mark ground strap location for proper reinstallation.

4. Remove output gear and shaft assembly and slide intermediate gear and pinion assembly off shaft.

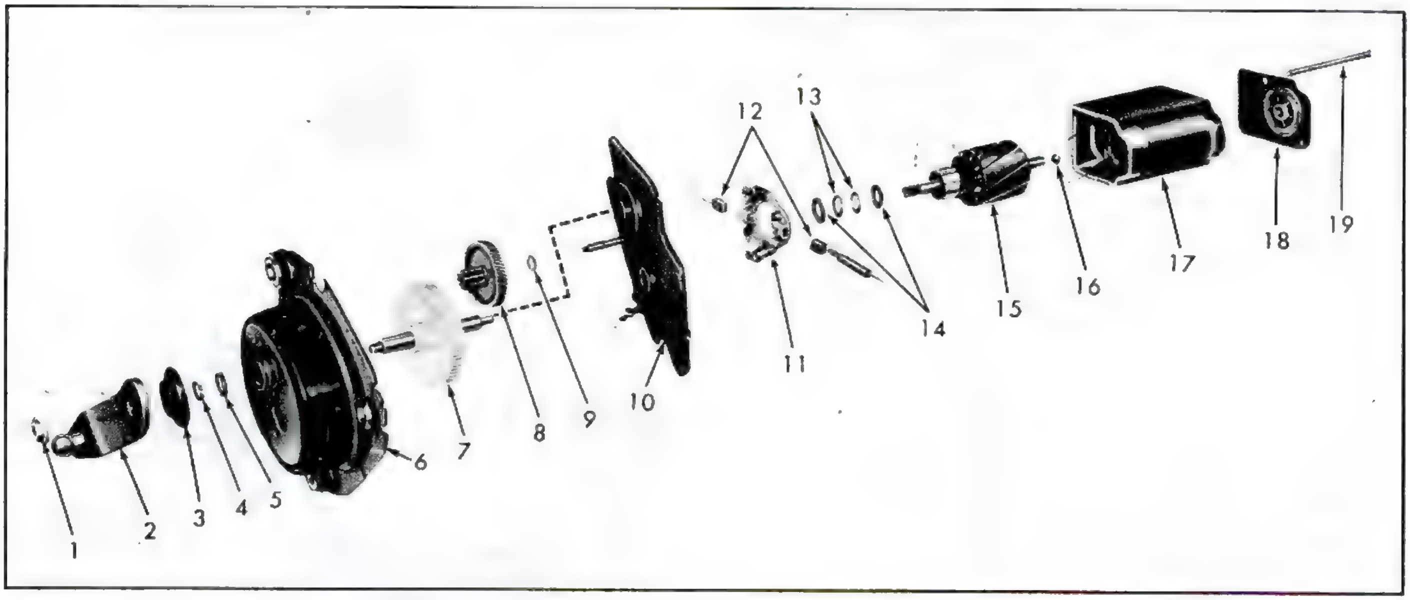


Fig. 30—Wiper Motor and Gear Box Exploded View (Typical)

1. Nut
2. Crank Arm
3. Seal Cap
4. Retaining Ring
5. Washer
6. Gear Box Cover
7. Output Gear and Shaft Assembly
8. Intermediate Gear
9. Wave Washer
10. Gear Box Housing
11. Brush Plate Assembly and Mounting Brackets
12. Brushes
13. Wave Washers
14. Flat Washers
15. Armature
16. Thrust Plug
17. Frame and Field
18. End Plate
19. Tie Bolts (Two required)

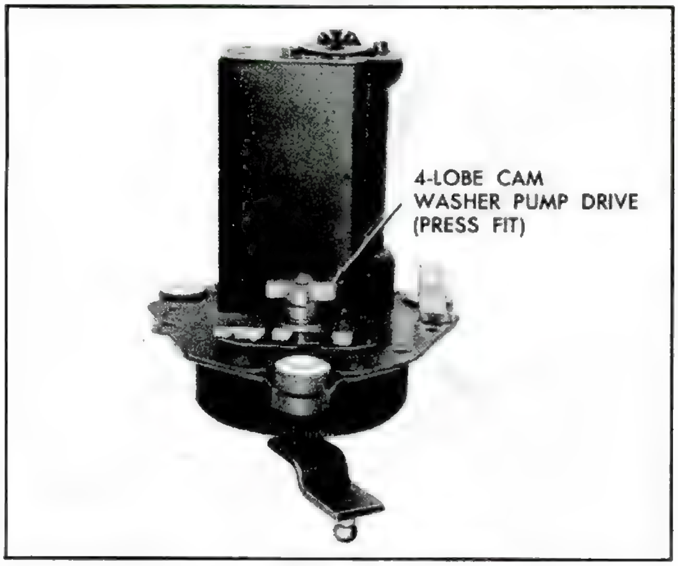


Fig. 31—Washer Pump Drive Cam Location

NOTE: Wave washer located on intermediate gear and pinion shaft.

5. When necessary, remove terminal board and park switch assembly as follows:
   a. Unsolder motor leads from terminals. Coding of motor leads not necessary on Type "E" single-speed wipers.
   b. Drill out rivets securing terminal board and park switch ground strap to mounting plate (fig. 32).

Motor

Refer to Figure 30.

1. Remove motor thru bolts, tap motor frame lightly, remove motor from mounting plate.
2. Release brush spring tension (fig. 33), slide armature and end plate from motor frame. Pull end plate from armature.

NOTE: Thrust plug located between armature shaft and end plate.

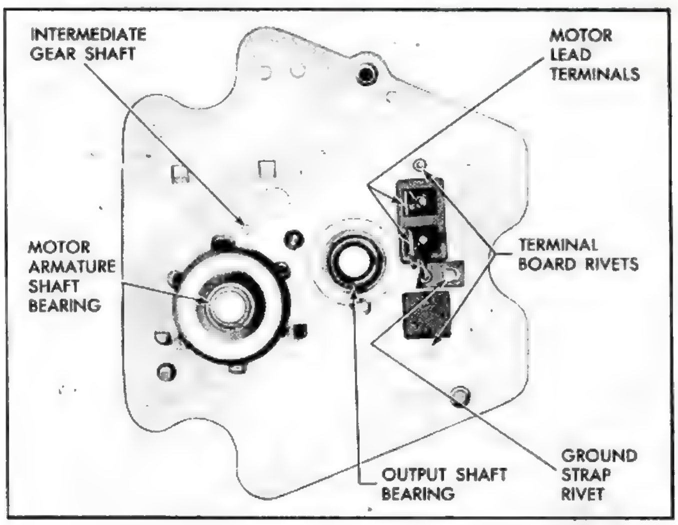


Fig. 32—Terminal Board—Single Speed Wiper

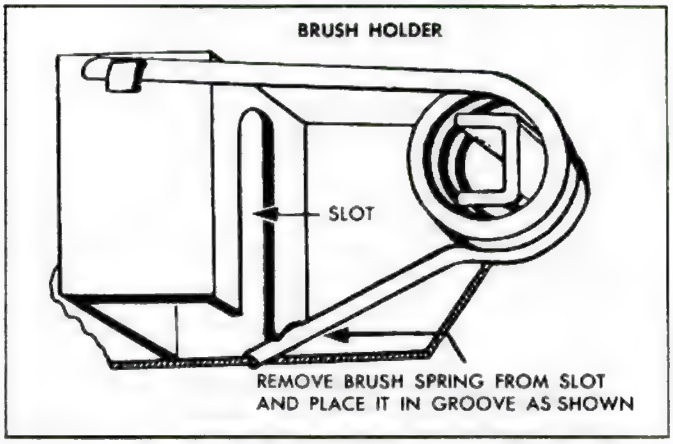


Fig. 33—Releasing Brush Spring Tension

3. Remove end play adjusting washers from armature, noting arrangement for proper reinstallation.

INSPECTION

Check and inspect all parts for serviceability, replace as necessary. All parts can be replaced individually except motor frame and field, which is serviced as an assembly. Service kits also provide screws, nuts, and washers to replace gear cover and terminal board rivets.

ASSEMBLY

Motor

Refer to Figure 30 for explode of motor and gear train.

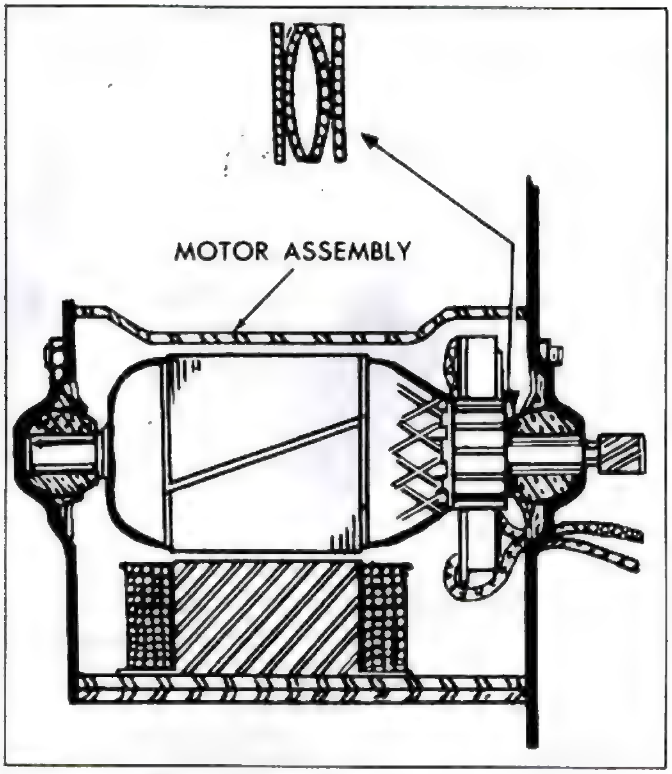


Fig. 34—End Play Washers Installed

1. Reassemble motor using reverse of disassembly procedure outlined above.

   NOTE: Lubricate armature shaft bushings with light machine oil. Armature end play is automatically adjusted by the proper installation of end play wave washers (fig. 34).

Gear Box

Refer to Figure 30 for explode of gear box.

1. Assemble gear box using reverse of disassembly procedure.

   NOTE: Lubricate gear teeth with Delco Cam and Ball Bearing Lubricant or equivalent. Be sure cover is properly located over dowel pins and be sure to reinstall ground strap.

2. Operate wiper to park position and install crank arm on output shaft so alignment marks line up with those on cover (fig. 35). Replace retaining nut, place crank arm in vise, tighten retaining nut.

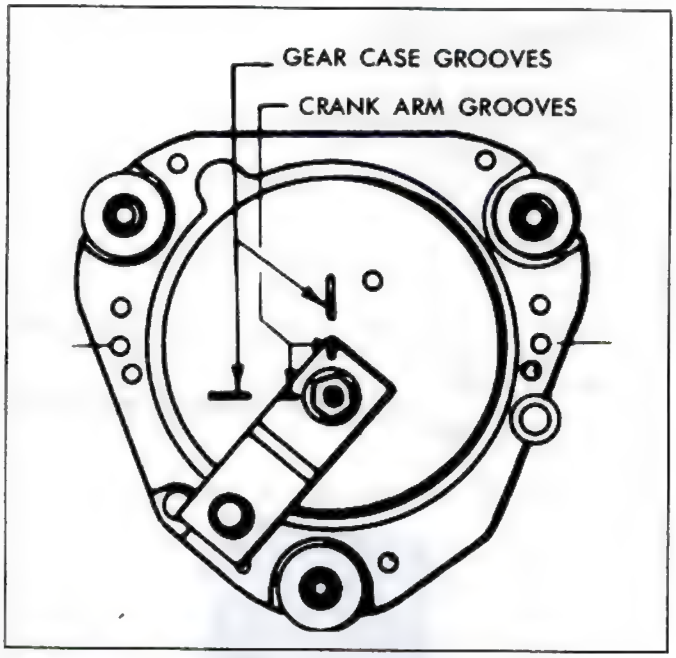


Fig. 35—Wiper Crank Arm in Park Position

WINDSHIELD WASHER

GENERAL DESCRIPTION

The positive displacement washer pumps used on the one and two speed non-depressed park wipers (fig. 36) use a pump mechanism consisting of a small bellows, bellows spring and vale arrangement driven by a 4 lobe nylon cam and pin assembly (fig. 37). The wiper motor drives the cam (fig. 38). Programming is accomplished electrically and mechanically by a relay assembly and ratchet wheel arrangement.

SERVICE OPERATIONS

REMOVAL AND INSTALLATION

Removal of the washer pump from the wiper motor consists of:

1. Disconnect wiring harness from washer.

   NOTE: Mark washer hoses for correct reinstallation.

2. Remove washer mounting bracket to wiper retaining screws, remove washer from wiper.
3. Reverse above procedure to install assembly.

CAUTION: Install washer multiplug harness connector with battery lead on terminal with no tang (fig. 36). Incorrect installation of connector will result in direct ground and destroy wiper motor fuse.

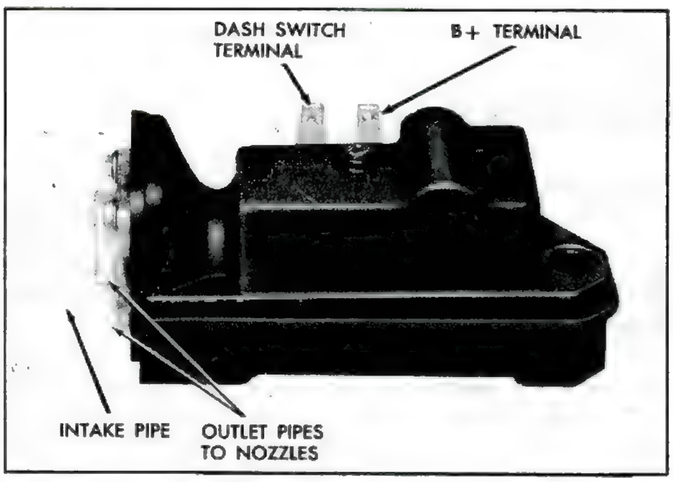


Fig. 36—Washer Pump

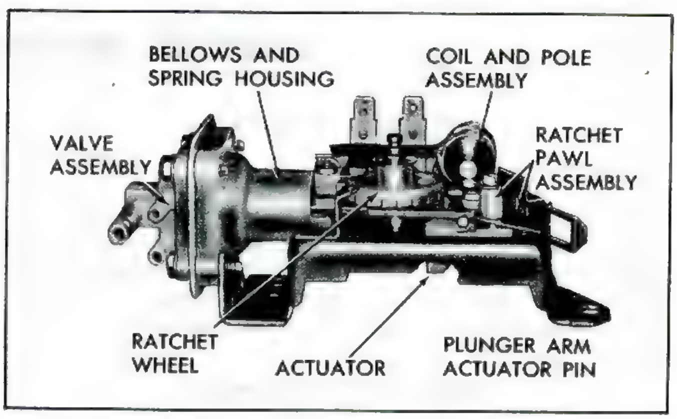


Fig. 37—Washer Pump Mechanism

DISASSEMBLY-ASSEMBLY

Refer to Figure 37.

1. Remove washer pump cover.
2. Remove Relay.
   a. To remove relay unsolder coil leads from terminals.

   NOTE: No coil polarity is necessary when resoldering coil leads.

   b. Remove coil retainer clip and slip coil assembly out of mounting bracket.
3. Ratchet Pawl.
   a. To remove ratchet pawl, disengage spring from ratchet pawl.

   CAUTION: Be sure spring is properly assembled before replacing washer pump cover.

   b. Remove "E" ring and slide ratchet pawl off shaft.
4. Terminal Board.
   a. Remove two attaching screws and relay terminal board assembly from washer base.
5. Ratchet Wheel.
   a. Remove retaining ring and slide the wheel from the shaft.
6. Valve Assembly.
   a. To remove valve assembly, remove 4 screws that secure valve assembly to bellows housing.

   CAUTION: It may be necessary to carefully pry bellows lip out of the valve body groove.

7. Bellows.
   a. To remove bellows first remove valve assembly.
   b. Manually operate pump clockwise to release pump from "lock-out" position (fig. 39).
   c. Hold bellows plunger arm from moving, then push in against bottom of bellows with thumb and twist 90° to remove bellows and bellows spring from housing.
8. Actuator Drive Pin.
   a. Remove actuator spring.
   b. Slide actuator drive from washer base.
9. To assemble washer unit, reverse above procedures.

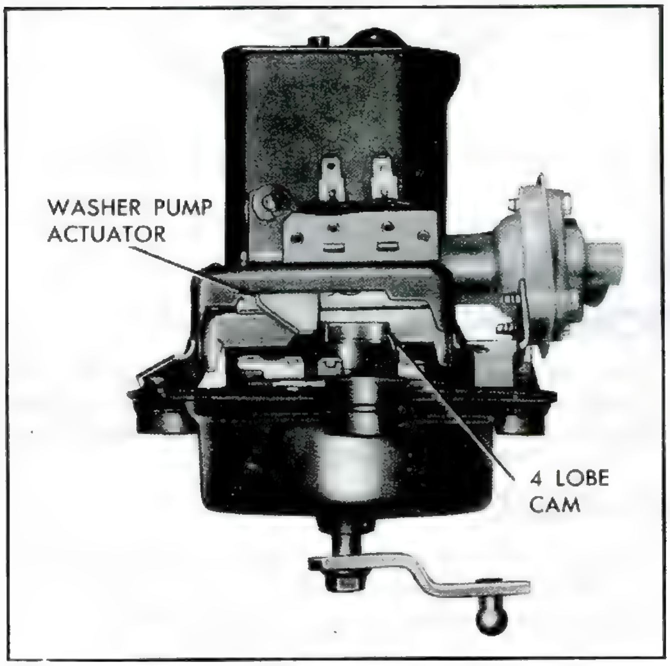


Fig. 38—Washer Drive Mechanism

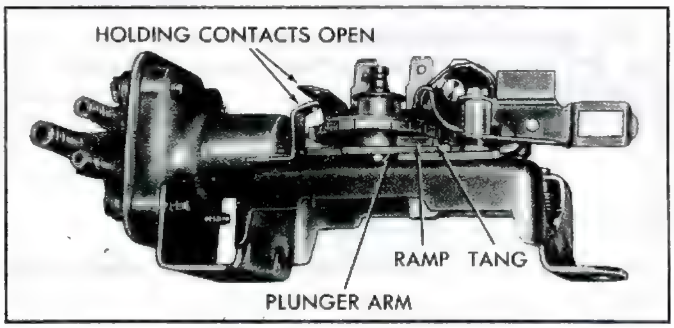


Fig. 39—Releasing Pump from Lockout Position

WIRING HARNESS ASSEMBLIES

WIRING HARNESS

The wiring harness assemblies incorporate the standardized color code common to all vehicles. Under this color code, the color of the wire designates a particular circuit. The harness name title indicates a type of harness, single or multiple wire, and also describes the location of the harness. Harness routings, composite wiring diagrams and a wiring color code are included in this section.

WIRING DIFFERENCES

On the high performance engine models, tachometer leads are attached at coil in engine compartment. Temperature indicator lamp, gauge and warning buzzer are connected as shown in wiring diagram (fig. 40). The thermister unit (fig. 41) is installed on the left cylinder head, the temperature pickup in the right head and the warning buzzer and diode (Silicon Rectifier) are located under dash panel (the diode in wire harness).

Figure 40 shows the engine warning system circuit. The diode (Silicon Rectifier) located between the light circuit and the buzzer circuit allows the light current to flow to ground through the closed engine temperature switch, but prevents the oil pressure switch from completing the buzzer circuit.

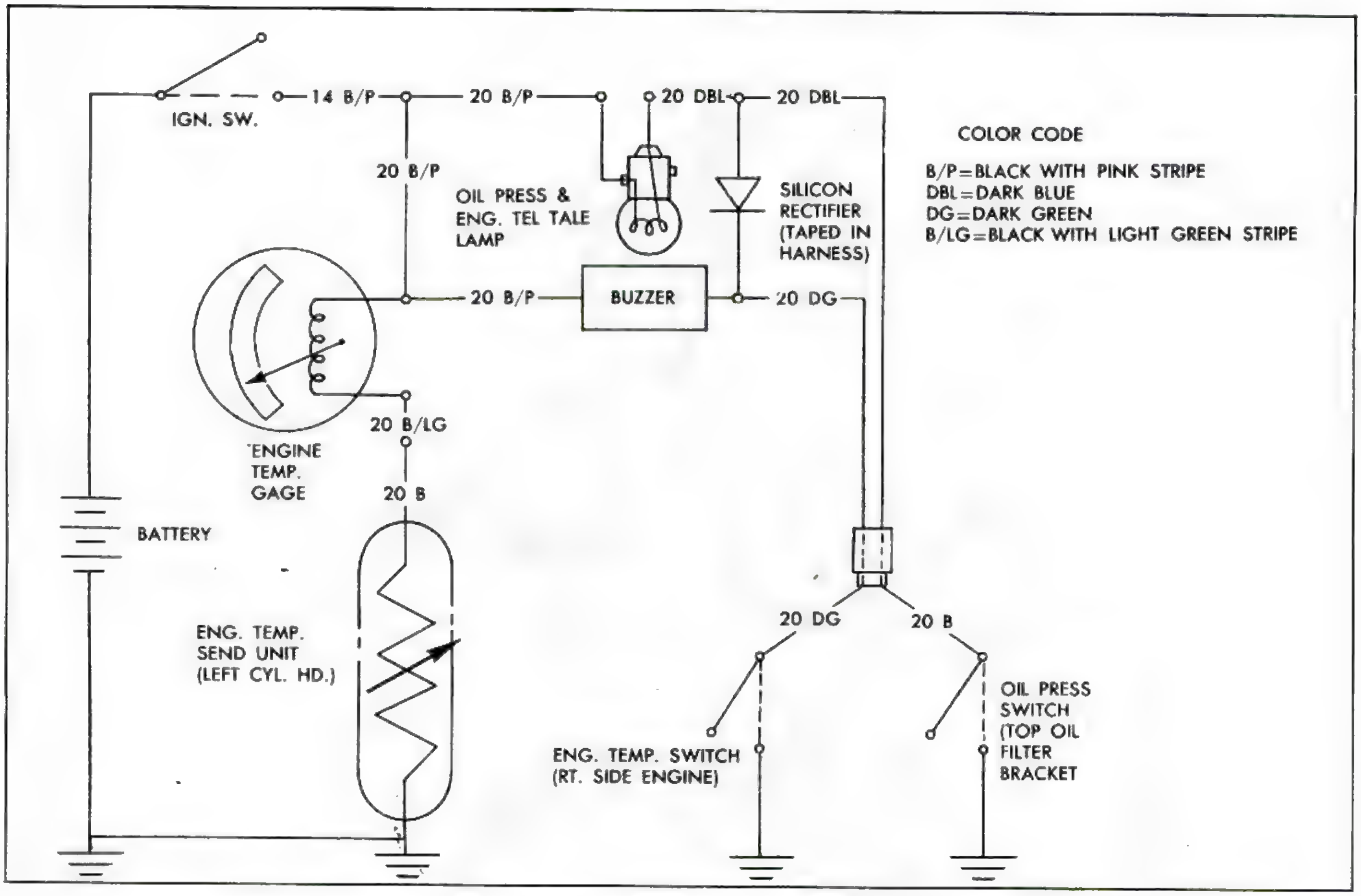


Fig. 40—Oil Pressure and Engine Temperature Tell-tale Lamp, Temperature Gauge and Warning Buzzer Wiring

WIRING CIRCUIT COLOR CODE

DIAGRAM KEY	WIRE COLOR
B	Black
B/LG	Black with Light Green Stripe
B/LBL	Black with Light Blue Stripe
B/P	Black with Pink Stripe
B/OR	Black with Orange Stripe
B/W	Black with White Stripe
B/Y	Black with Yellow Stripe
BRN	Brown
DBL	Dark Blue
DG	Dark Green
PPL	Purple
R	Red
T	Tan
GY	Gray
W/OR/P	White with Orange and Pink Stripes

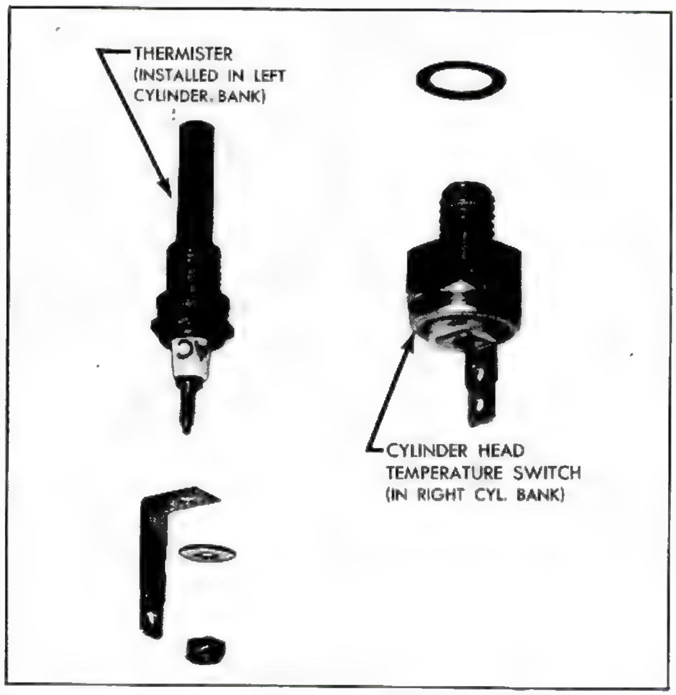


Fig. 41—Cylinder Head Temperature Sensing Units

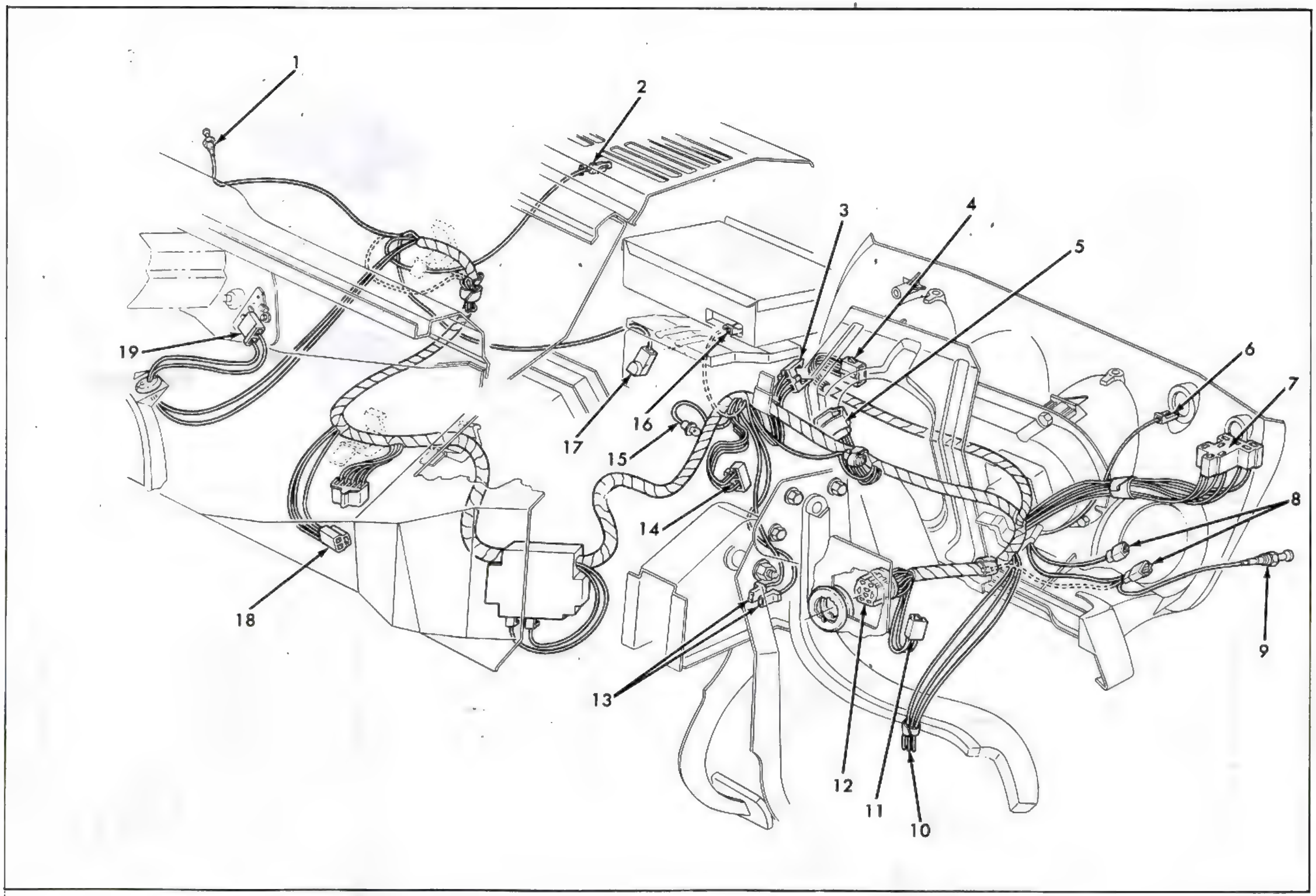


Fig. 42—Instrument Panel Wiring

1. R.H. Door Jamb Switch (10500-700)
2. To Instrument Panel Compartment Light (10500-700)
3. To Ignition Switch
4. To Instrument Cluster Wiring Harness
5. To Directional Signal Harness
6. To Wiper Switch
7. To Light Switch
8. To Dome Lamp
9. L. H. Door Jamb Switch
10. To Dimmer Switch
11. To Warning Buzzer (10700 only)
12. To Forward Lamp Wiring Harness
13. To Stop Lamp Switch
14. To Heater Blower Switch
15. Heater Control Lamp
16. To Radio
17. To Cigarette Lighter
18. To Heater Resistor
19. To Wiper

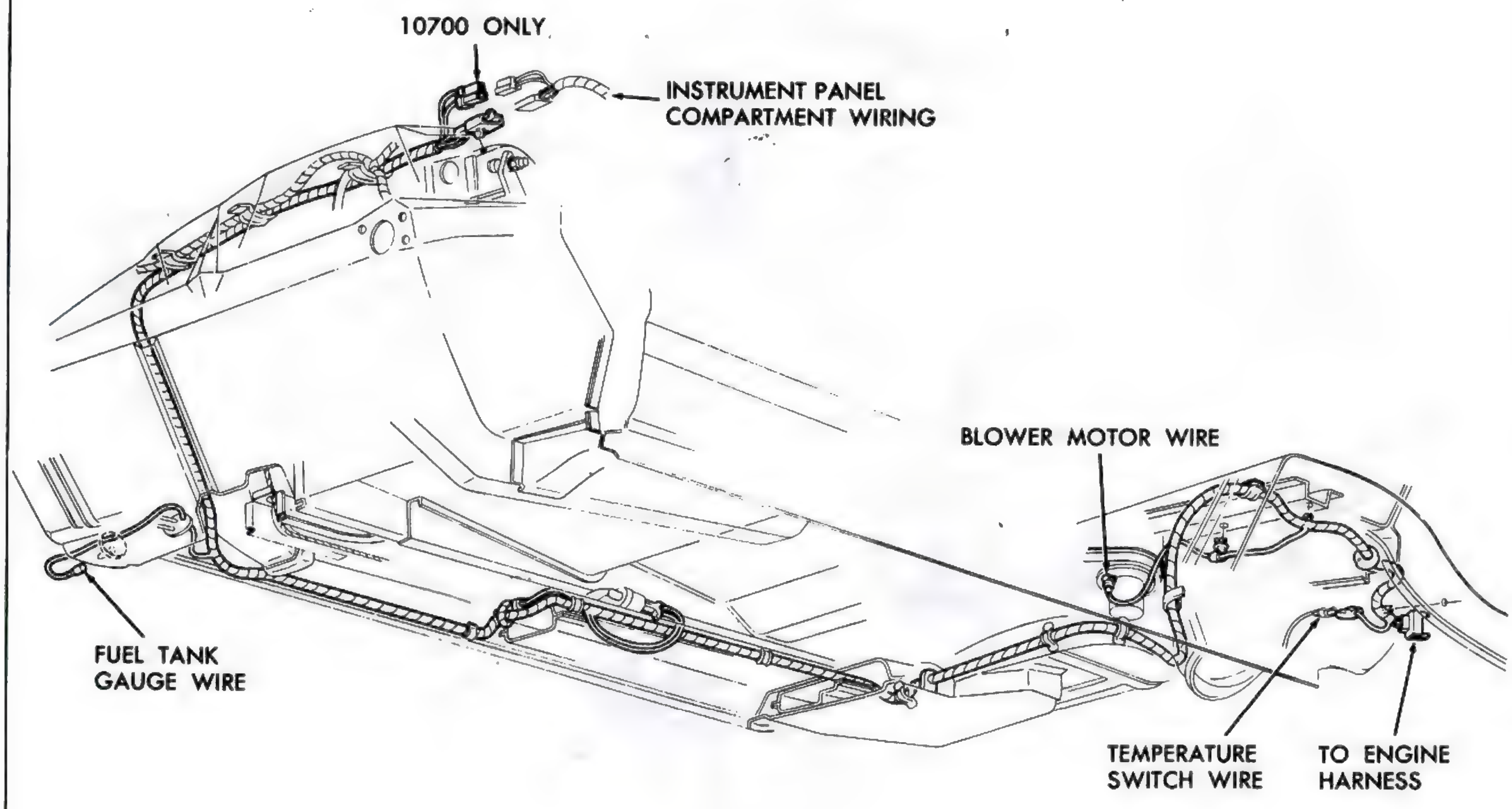


Fig. 43—Body Wiring Harness

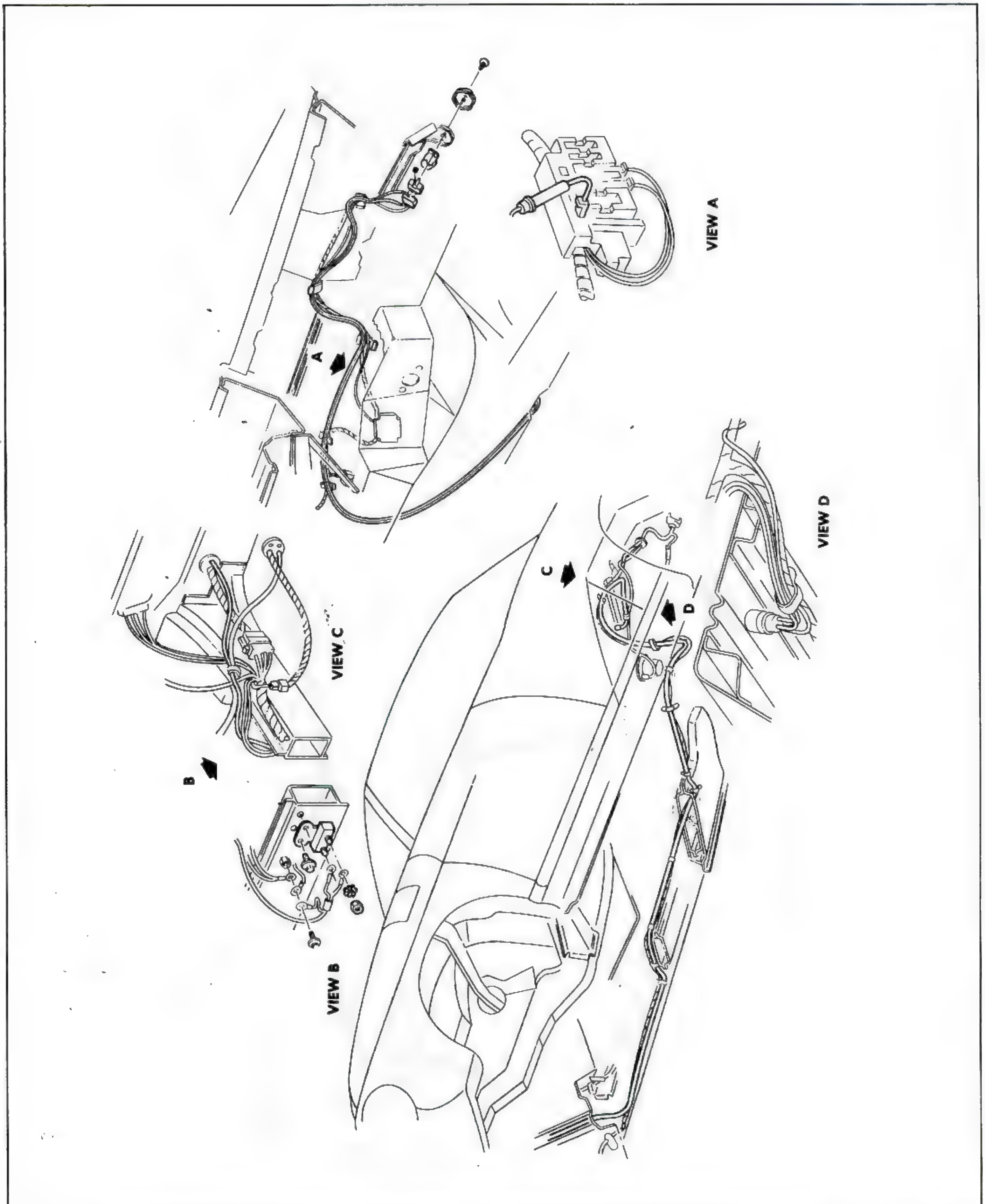


Fig. 44—Power Feed Wiring

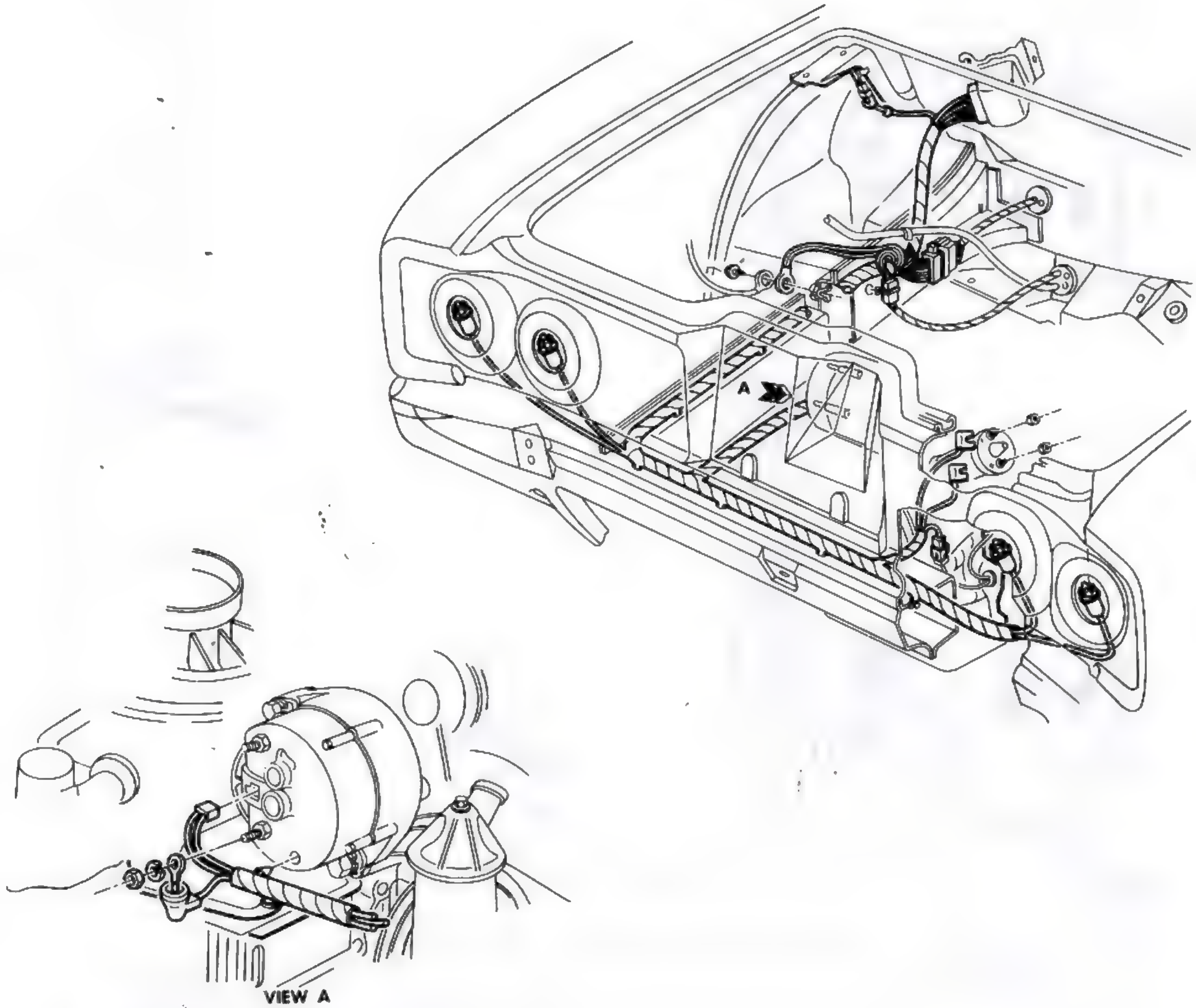


Fig. 45—Engine Compartment Wiring

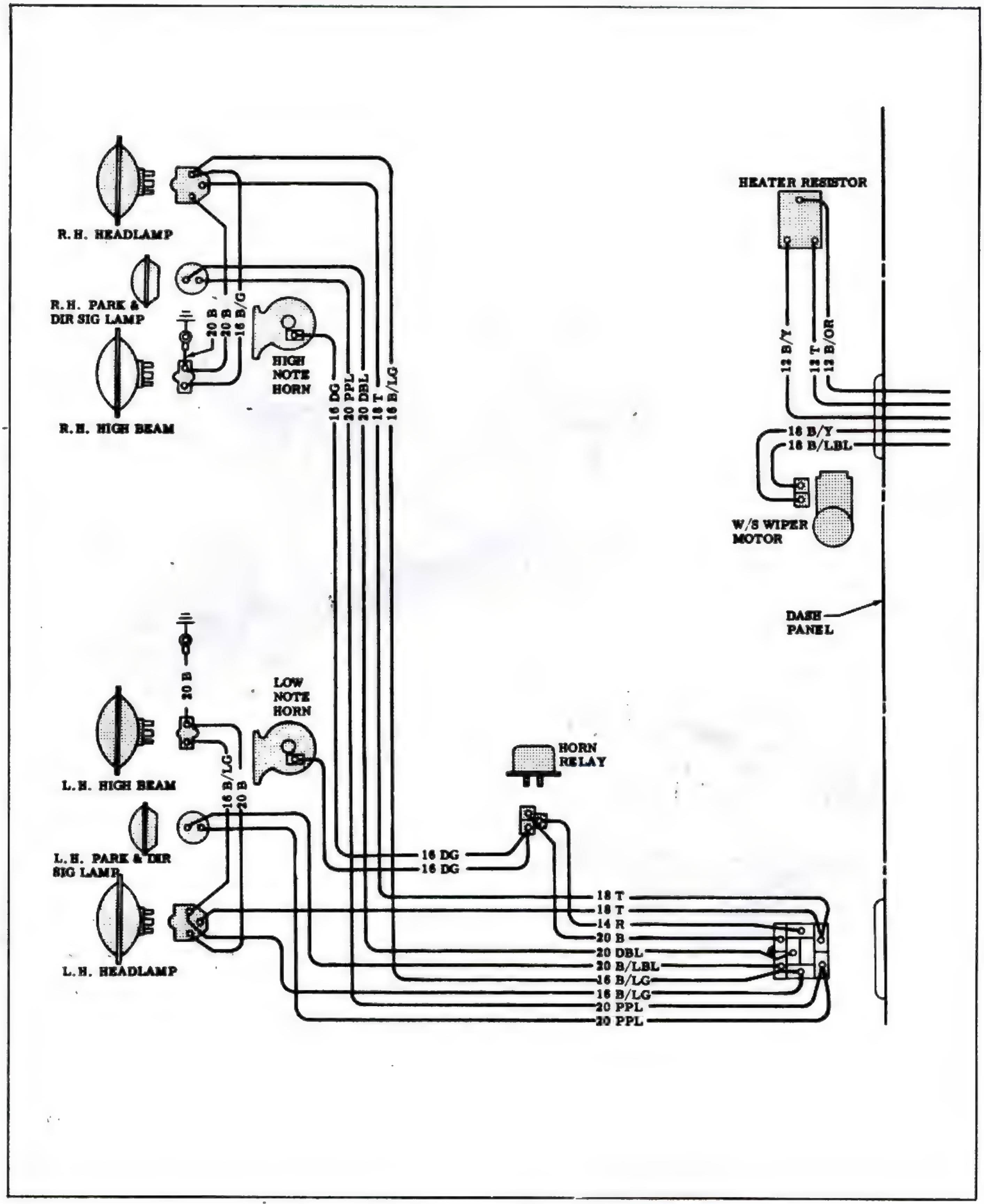


Fig. 46--Front End

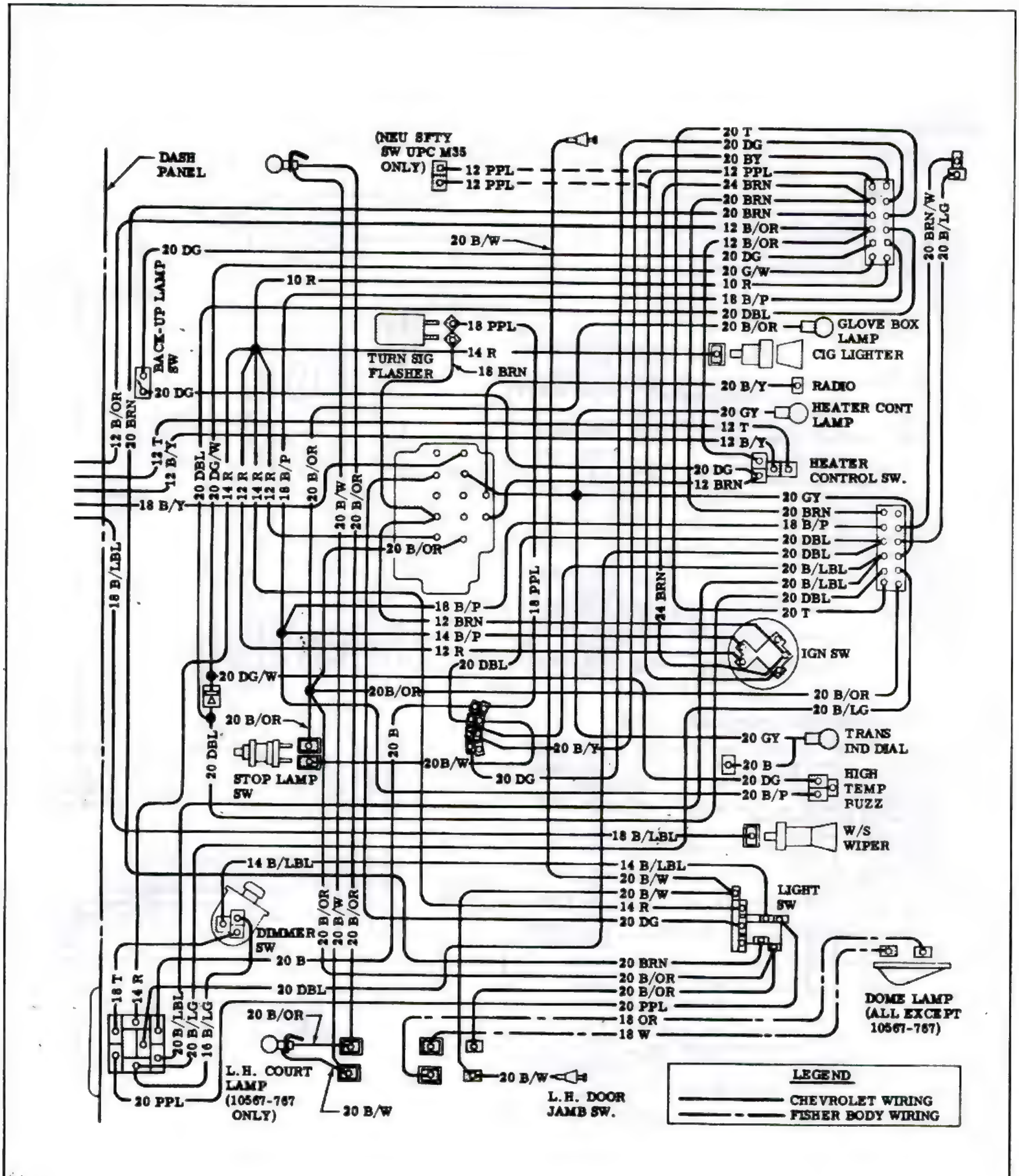


Fig. 47—Engine and Tail Lamps

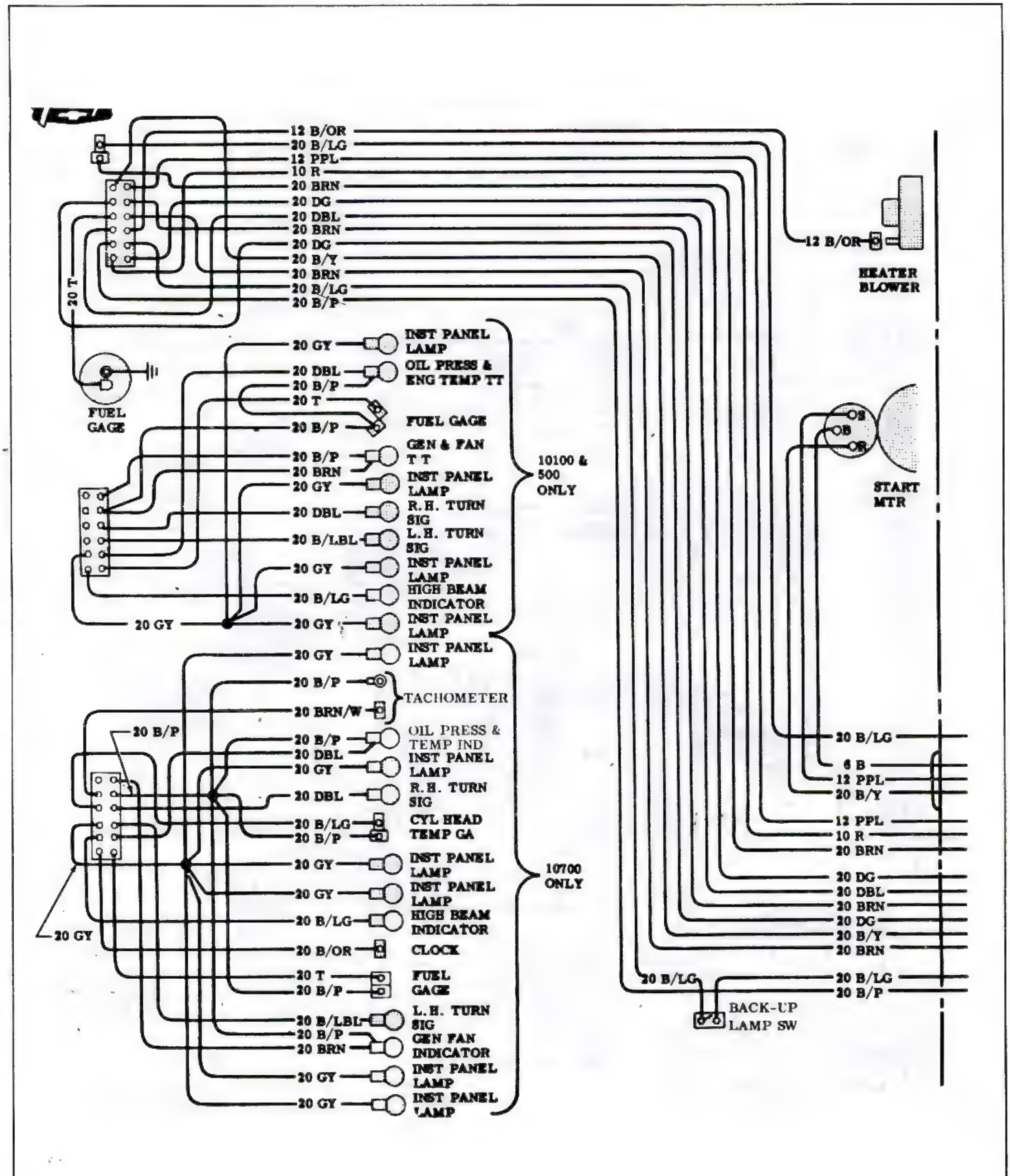


Fig. 48—Instrument Cluster and Body Harness

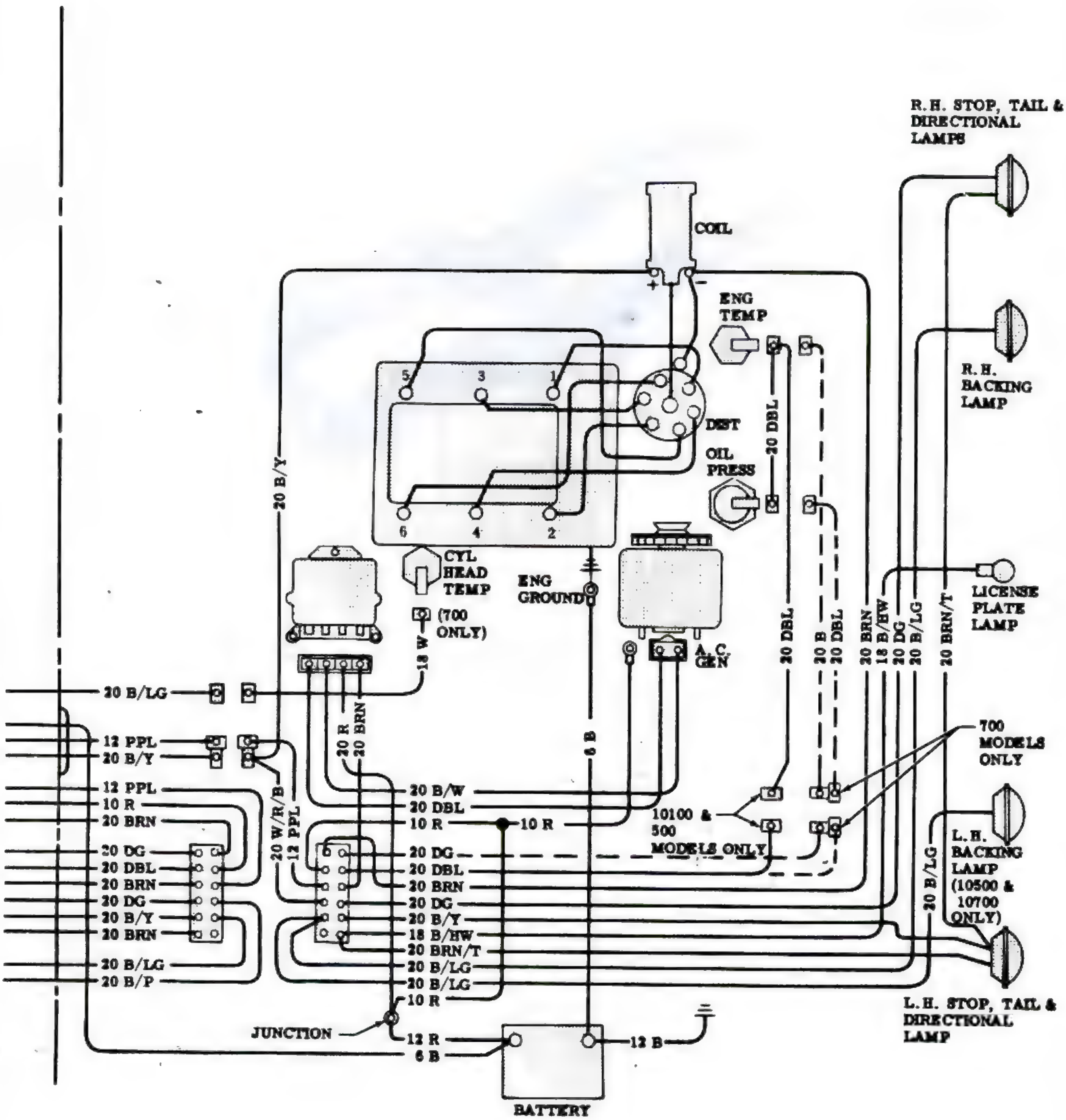


Fig. 49—Fuse Panel and Instrument Panel

SPECIAL TOOLS

Fig. 50—Special Tools

SECTION 14
BUMPERS
CORVAIR 10,000 SERIES

INDEX

GENERAL DESCRIPTION

The Corvair front and rear bumpers are of the one-piece design. Each bumper is attached to the body by five mounting brackets at reinforced areas of the body.

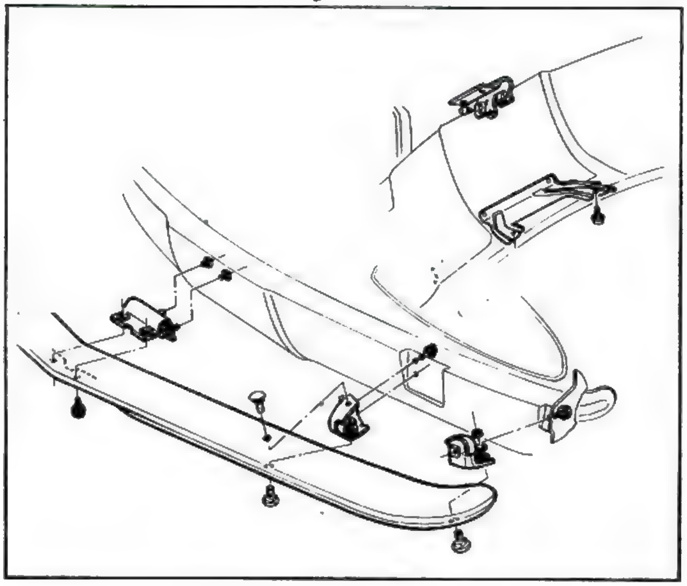


Fig. 1—Front Bumper Attachment

FRONT BUMPER ASSEMBLY (See Fig. 1)

Removal

1. Open compartment lid and remove cover at each front corner of compartment.
2. Remove three mounting bracket attaching bolts at each corner.
3. Remove license plate.
4. Remove two center mounting bracket bolts.
5. Remove bumper from vehicle.

Installation

1. If installing new bumper, transfer bumper brackets, if undamaged, to bumper before installation to body.
2. Install attaching bolts for center inner and outer brackets.
3. Tighten all bolts securely; install license plate.

REAR BUMPER ASSEMBLY (See Fig. 2)

Removal

1. From inside engine compartment, remove inner and outer bracket attaching bolts (three each side). Remove spare tire to gain access to right hand bolts.
2. Remove bolt attaching center bracket to body.
3. Remove bumper from vehicle.

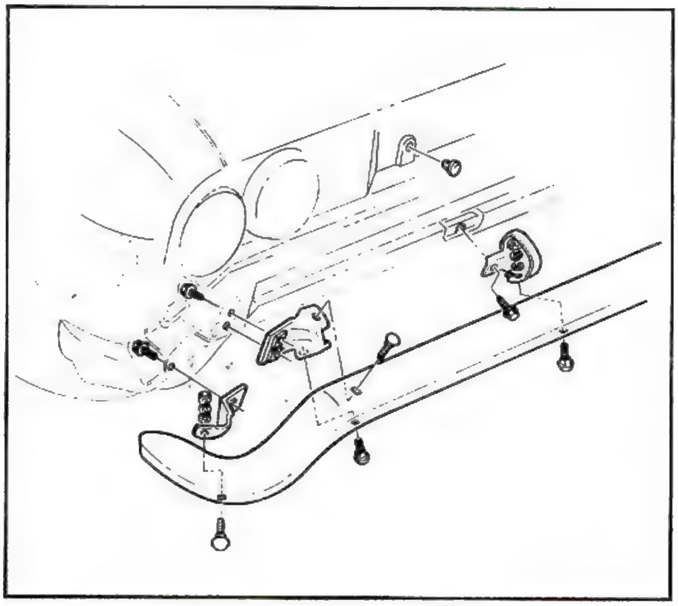


Fig. 2—Rear Bumper Attachment

Installation

1. If installing new bumper, transfer brackets, if undamaged, to bumper before installation to body.
2. Install attaching bolts for center inner and outer brackets.
3. Tighten bolts securely.

SECTION 15
HEATER AND ACCESSORIES

CONTENTS OF THIS SECTION

DIRECT AIR HEATER

INDEX

GENERAL DESCRIPTION

The 1965 Corvair Direct Air Heater, utilizing the engine heat rejection principle, is a refinement of the direct air heater used in past years. Extremely fast and even heating is provided through heater outlets in the front and rear seat areas. The system also includes defroster outlets at the windshield. In operation, this system makes use of the engine cooling air normally ducted out the rear of the engine after performing its cooling function. This air is instead routed through two flexible hoses and into the heater inlet assembly. (This assembly contains deflector doors necessary for temperature control and for shutting off the air flow to the passenger compartment when desired.) The heated air is mixed in the air inlet assembly with cooler air drawn through a single flexible hose from the upper engine shroud. The cooler, or tempering, air will maintain a temperature of about 110°F. during normal vehicle operation while the heated air entering the inlet case may reach 160°F.

The air, thus tempered, now flows through a flexible hose to the rear duct assembly, and through this duct to the front duct and valve assembly. The position of the diverter door in the valve assembly determines whether the air flow will enter the front compartment at this point or will continue on through the defroster ducts for defroster operation. Figures 1 and 2 illustrates the air flow through the various components of the system.

Heater Odors

Because of the inherent characteristics of the heater, objectionable fumes in the engine compartment may be drawn into the passenger compartment and result in owner complaints. These complaints can be reduced in number by cautioning the owner on the importance of maintaining a clean engine. Oil spilled or dripped on the engine shrouding may result in some passenger discomfort, and care should be taken to see that such drips and spills are thoroughly cleaned up immediately. However, complaints of objectionable odors in the passenger compartment, whether the heater is on or off, should be traced immediately and promptly corrected. Procedures and possible locations to check for faulty engine gaskets or seals are covered under "Maintenance and Adjustments" of Section 6.

SERVICE OPERATIONS

BLOWER AND HOUSING

Removal

1. From beneath the vehicle, remove the large diameter heated air hose from the right side of the air inlet assembly.
2. Remove the blower motor wire at the connector.
3. Remove the blower mounting plate screws attaching the blower to the blower housing.
4. Work the motor and mounting plate down and out of the housing.
5. If it is necessary to remove the blower housing, proceed as follows:

   Remove the two screws attaching the blower outlet adapter to the blower and, if clearance is still needed, remove the adapter to rear duct assembly hose at the rear duct assembly and take the hose and adapter as a unit from the car.
6. Reach up into the blower housing and remove the housing to inlet assembly attaching screws and remove the housing.

Installation

1. Remove the blower drum from the old blower motor and replace on a new motor.
2. Replace the blower housing, if it was previously removed.

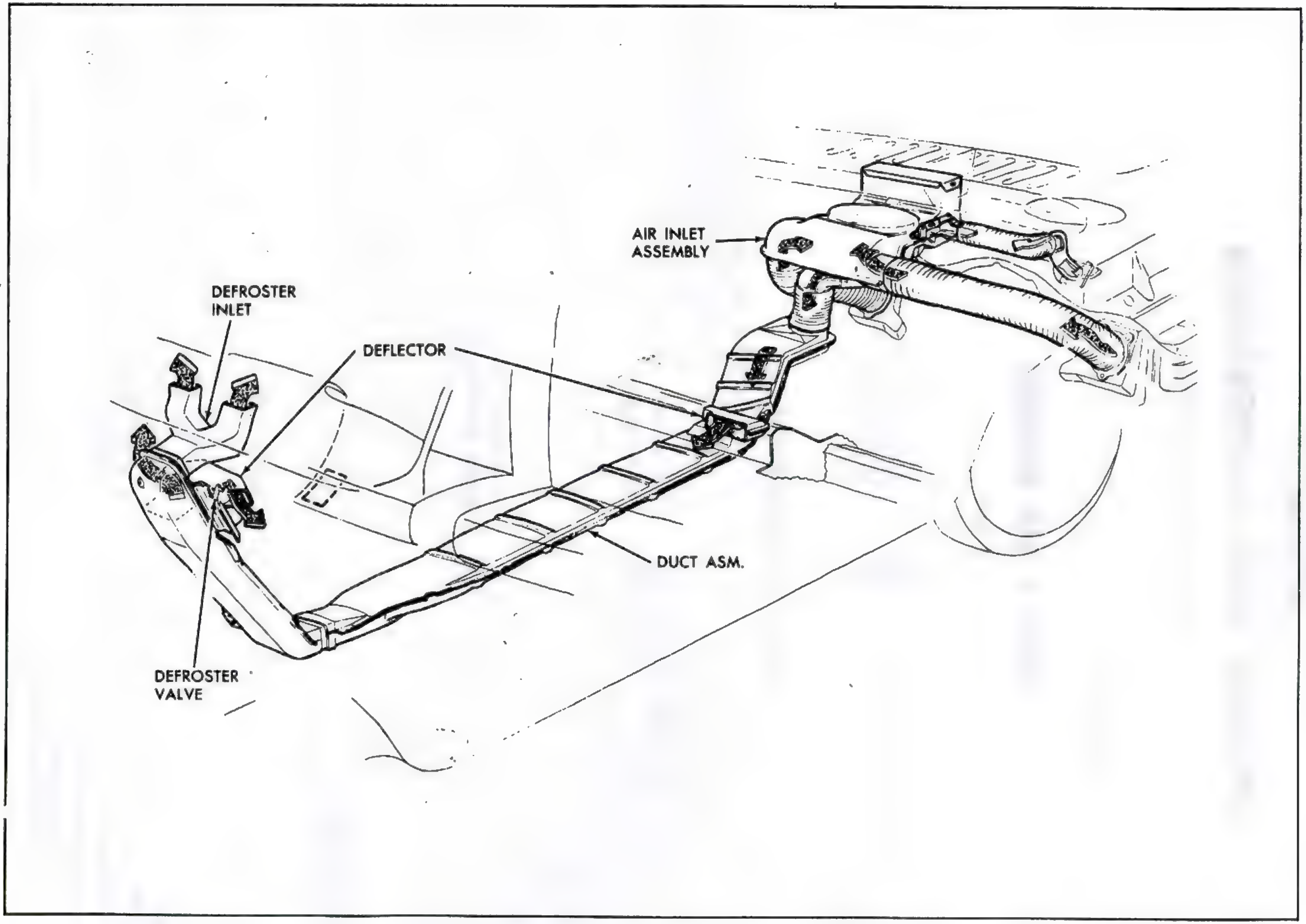


Fig. 1—Direct Air Heater Airflow

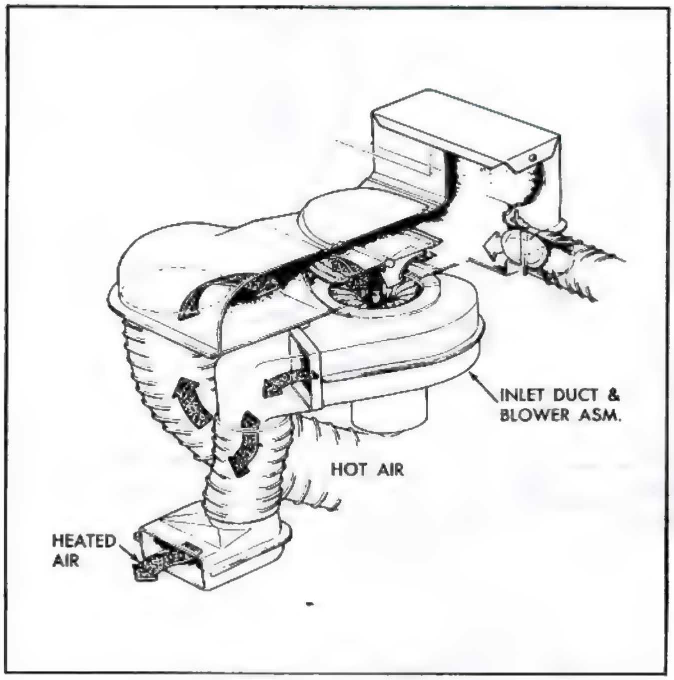


Fig. 2—Heater Inlet Duct and Blower Assembly

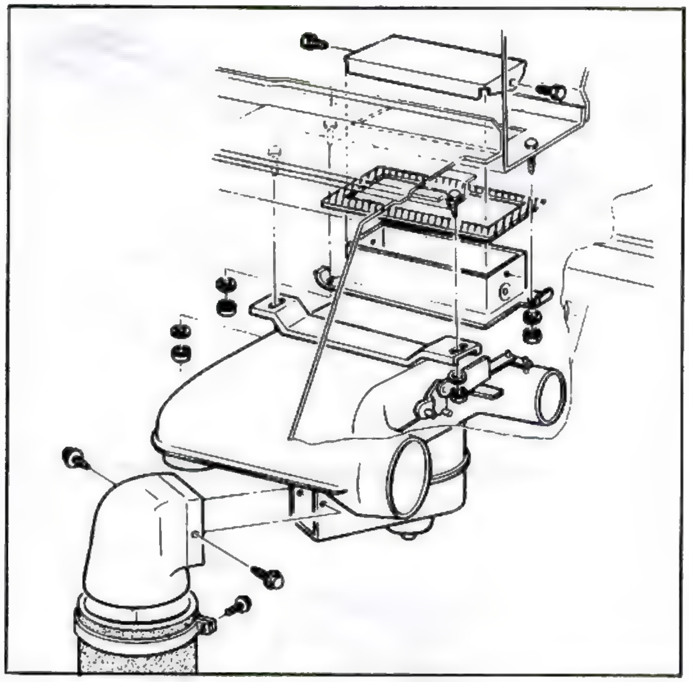


Fig. 3—Heater Blower and Air Inlet Assembly

3. Replace the motor and blower assembly in the housing and install the attaching screws.
4. Plug in the wiring connector.
5. Replace the blower outlet adapter and the heater air hoses, if previously removed.
6. Reach up into the blower housing and remove the housing to inlet assembly attaching screws and remove the housing.

AIR INLET ASSEMBLY

Normally the only disassembly procedure necessary on the direct air heater air inlet assembly will be the replacement of a malfunctioning blower motor. Removal of the air inlet assembly should seldom be necessary unless the diverter doors are bent or inoperative, resulting in warm air entering the passenger compartment even with the controls in the OFF position. This condition is unlikely except in collision damage.

Removal

1. Remove the blower motor as previously described.
2. Remove the outlet adapter and hose and the blower housing as previously described.

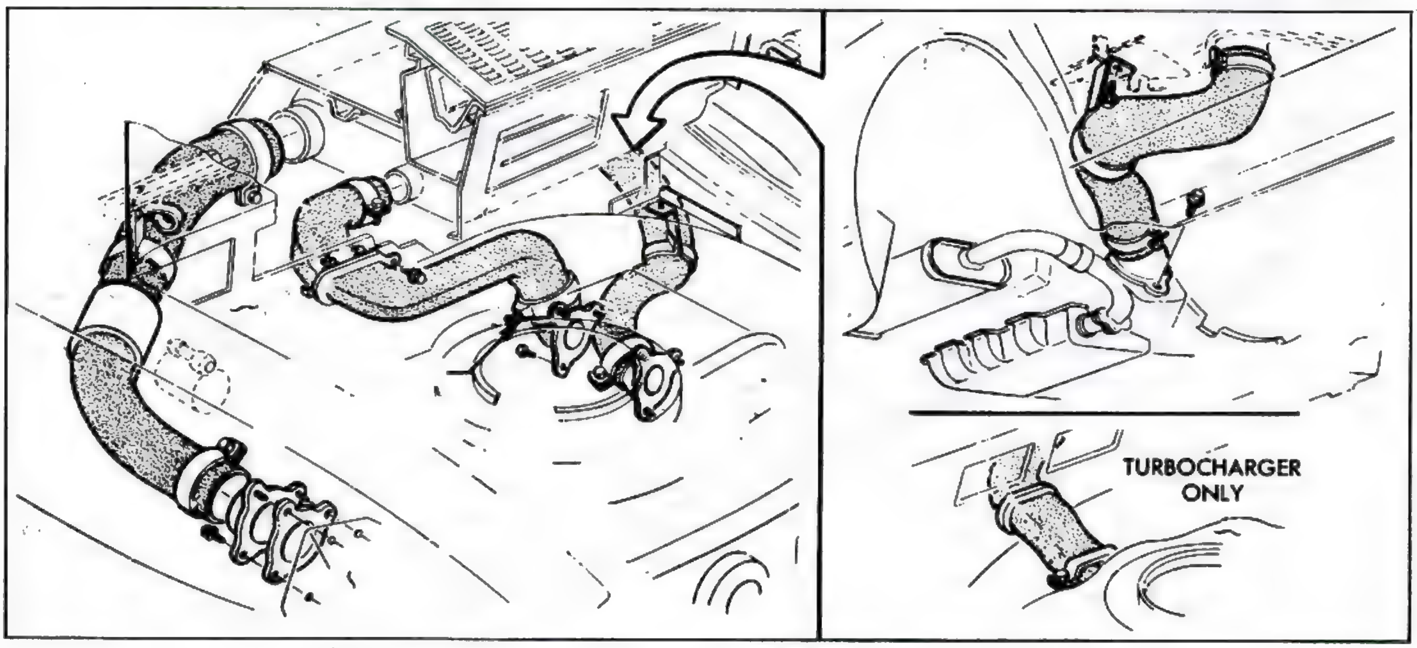


Fig. 4—Heater Hoses

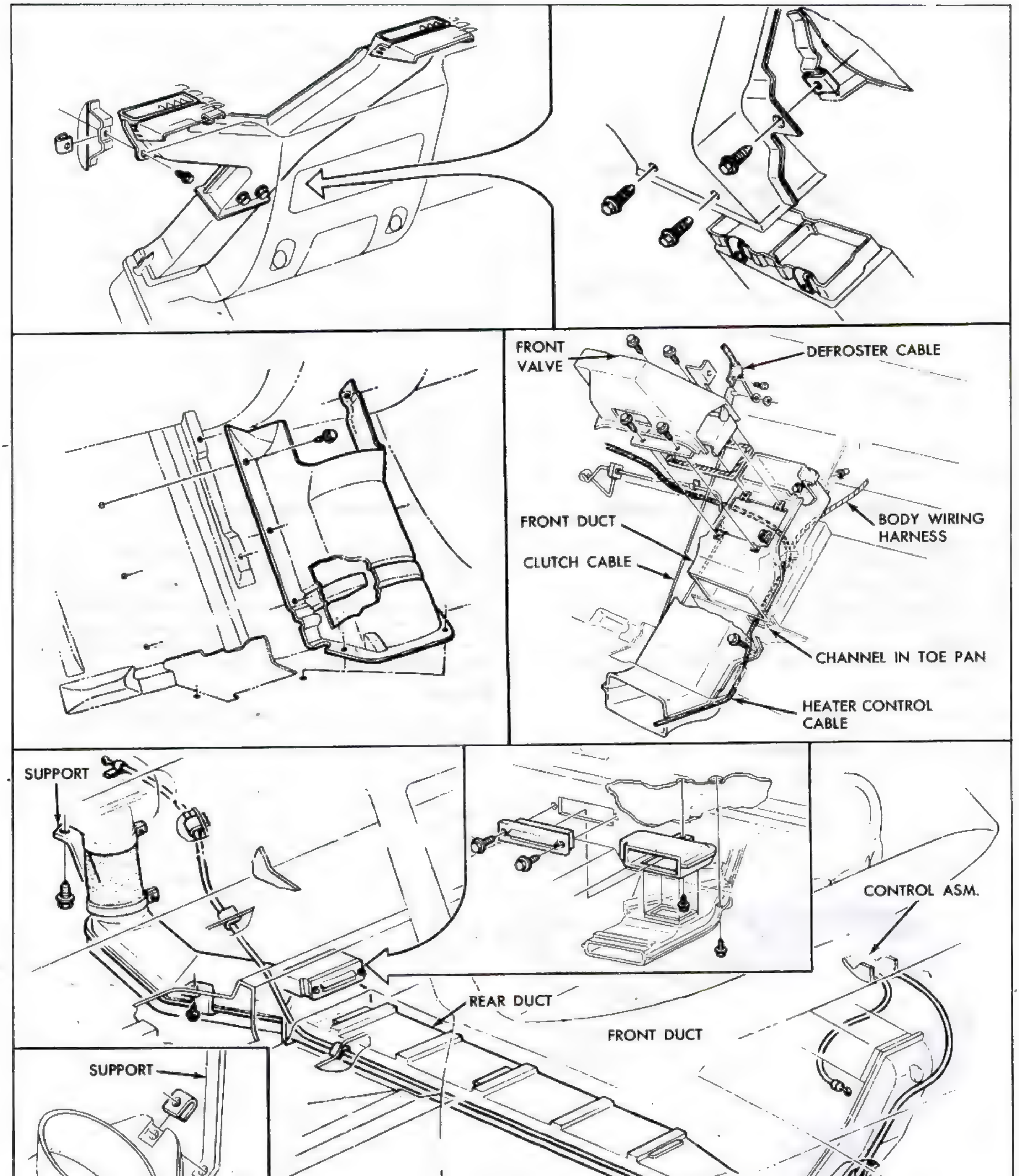


Fig. 5—Heater Air Ducts

3. Remove both flexible hoses from the left side and the single flexible hose from the right side of the air inlet assembly.
4. Remove the bowden control cable from the air inlet assembly.
5. Remove the four nuts and washers attaching the air inlet assembly to the underbody studs, lower the assembly and carefully remove. (See Figure 3).

Installation

1. Hold the inlet assembly in position and install the four attaching nuts and washers.
2. Install the control cable and the air ducts on the left side.
3. Replace the blower housing and motor.
4. Replace remaining air ducts.

HEATER HOSES

Figure 4 illustrates the three engine to air inlet assembly hoses and their attachment.

REAR DUCT ASSEMBLY

Removal (Fig. 5)

1. From beneath the car, remove rear duct support at the air inlet end as well as the rear duct end.
2. Remove the air inlet to rear duct hose at the rear duct.
3. Remove the front and rear underbody shields.
4. Remove the duct to underbody attaching screw and lower the duct, disconnecting the clips attaching the control cable along the right side of the duct.
5. Carefully pull the duct rearward and away from the front heat duct assembly.

Installation

1. Slip the rear duct into the front duct assembly and install the rear duct attaching screws.
2. Carefully install the control cable and clips along the right side of the rear duct.
3. Replace the duct to air inlet support and the inlet to duct hose at the inlet.

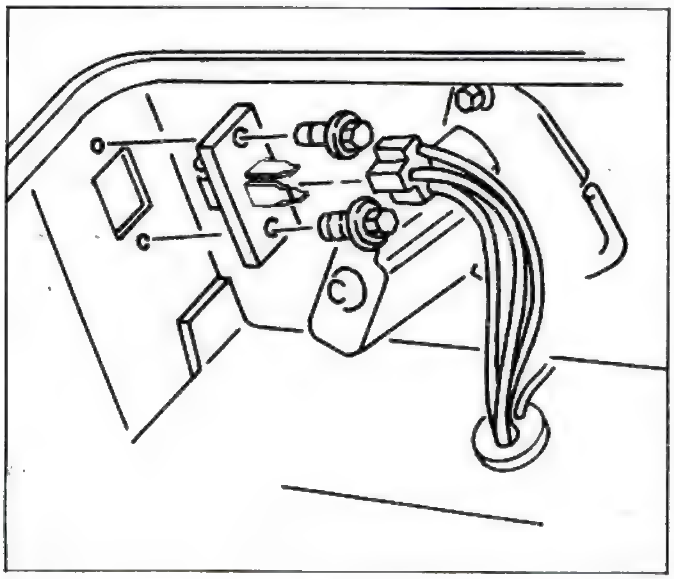


Fig. 6—Resistor Installation

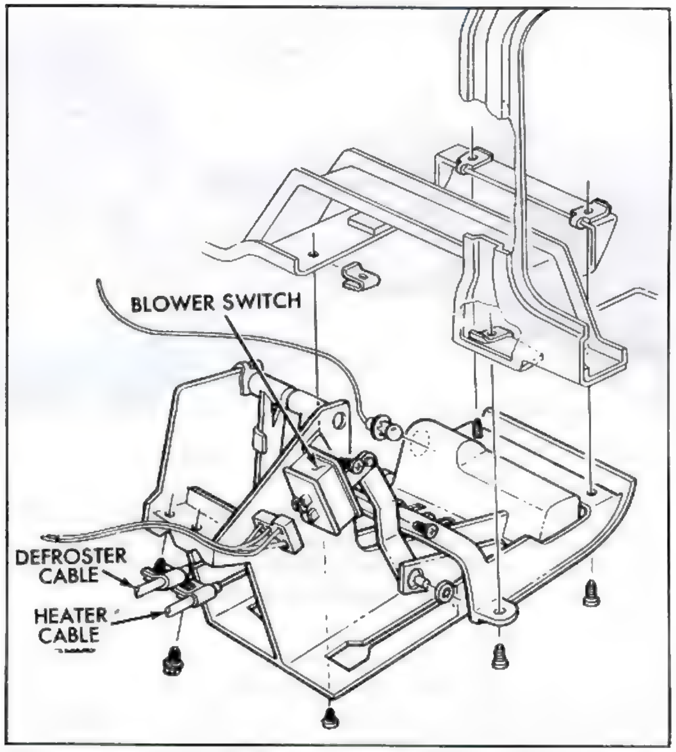


Fig. 7—Heater Control Panel Installation

4. Replace the front and rear underbody shields. (See Section 11—Chassis Sheet Metal).

AIR DUCTS

All air ducts and attachment parts are illustrated in Figure 5.

HEATER RESISTOR

The heater resistor location is at the right rear of the luggage compartment, just to the right of the windshield wiper motor as shown in Figure 6.

CONTROLS

The Direct Air Heater is controlled by means of a 3-lever control panel mounted in the lower portion of the dash panel to the right of the steering column (Figure 7 illustrates control installation). Operation of these levers is as follows:

Fan

The fan lever controls the 3-speed blower motor. Fully down position of this lever will result in highest blower speed.

Heat

This lever controls, through diverter doors in the air inlet assembly, the proportion of heated and cooler air entering the mixing chamber of the assembly. In its full "up" position this lever will allow no air to flow into the car. As the lever is moved down air from within the engine shroud above the engine cylinders is passed into the mixing chamber, through the blower and on into the car. As the lever is moved further down, heated air which has already passed through the cylinders and performed its

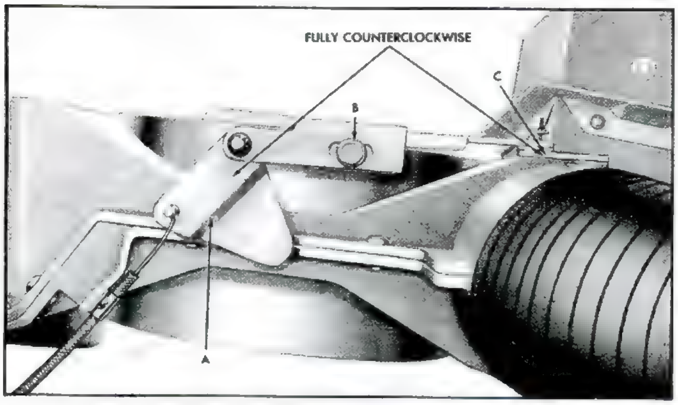


Fig. 8—"Heat" Control Cable

engine cooling function, is mixed with this cooler air to increase the temperature of air delivered to the interior of the vehicle. With the lever fully down, 100% heated air is being supplied to the heater outlet ducts.

Def

The defroster lever, through its bowden cable, controls the positioning of a deflector door in the defroster valve assembly. With the defroster control fully "up" heated air is allowed to flow into the passenger compartment through the heater outlet. In the full "down" position of the lever, the entire air flow will pass up through the defroster duct to the defroster outlets on the top of the instrument panel. Intermediate positioning of this lever will allow an almost unlimited number of settings. Thus, part of the airflow may be directed to the defrosters while the remainder will continue to flow into the passenger compartment.

Off Positions

To completely shut off the heater, all three levers should be in the fully up position.

HEAT CONTROL CABLE

Adjustment

Figure 8 illustrates the HEAT control cable attachment at the Air Inlet Assembly. Cable length may be adjusted, by means of an elongated slot in the cable to Air Inlet Assembly attaching clip, so that when the dash control lever is fully "up" lever A is rotated fully counter-clockwise. (Accomplish this setting by inserting a 1/8" diameter rod through the holes in the control panel frame to hold all control levers fully "up"; then loosen the HEAT control cable attachment at the Air Inlet Assembly, and, while pulling firmly on the cable, retighten the cable attaching screw.) With lever A so adjusted, loosen nut B, rotate lever C fully counter-clockwise, then tighten nut B. Remove the 1/8" diameter rod from the control panel frame.

> **NOTE:** The damper door controlled by lever C is designed to shut fully only when the lever is in its counter-clockwise position.

ALL-WEATHER AIR CONDITIONING SYSTEM

INDEX

GENERAL DESCRIPTION

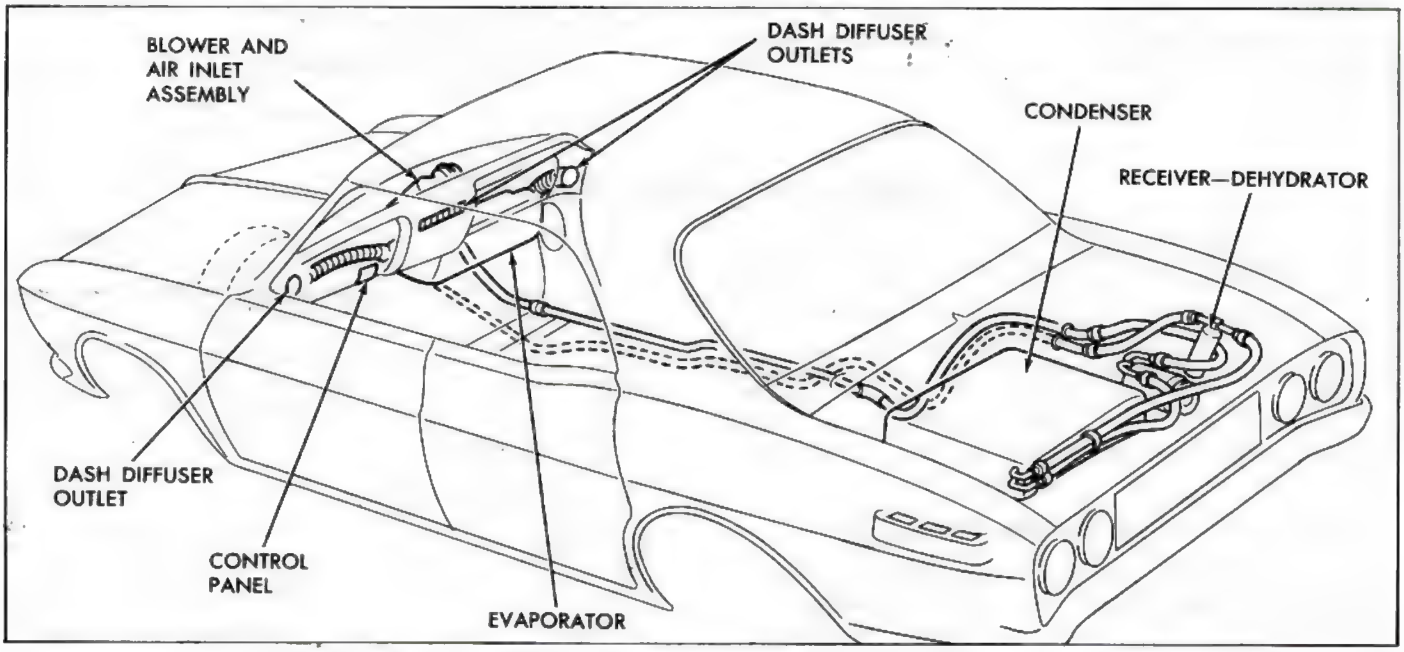


Fig. 9—Corvair All-Weather Air Conditioning System

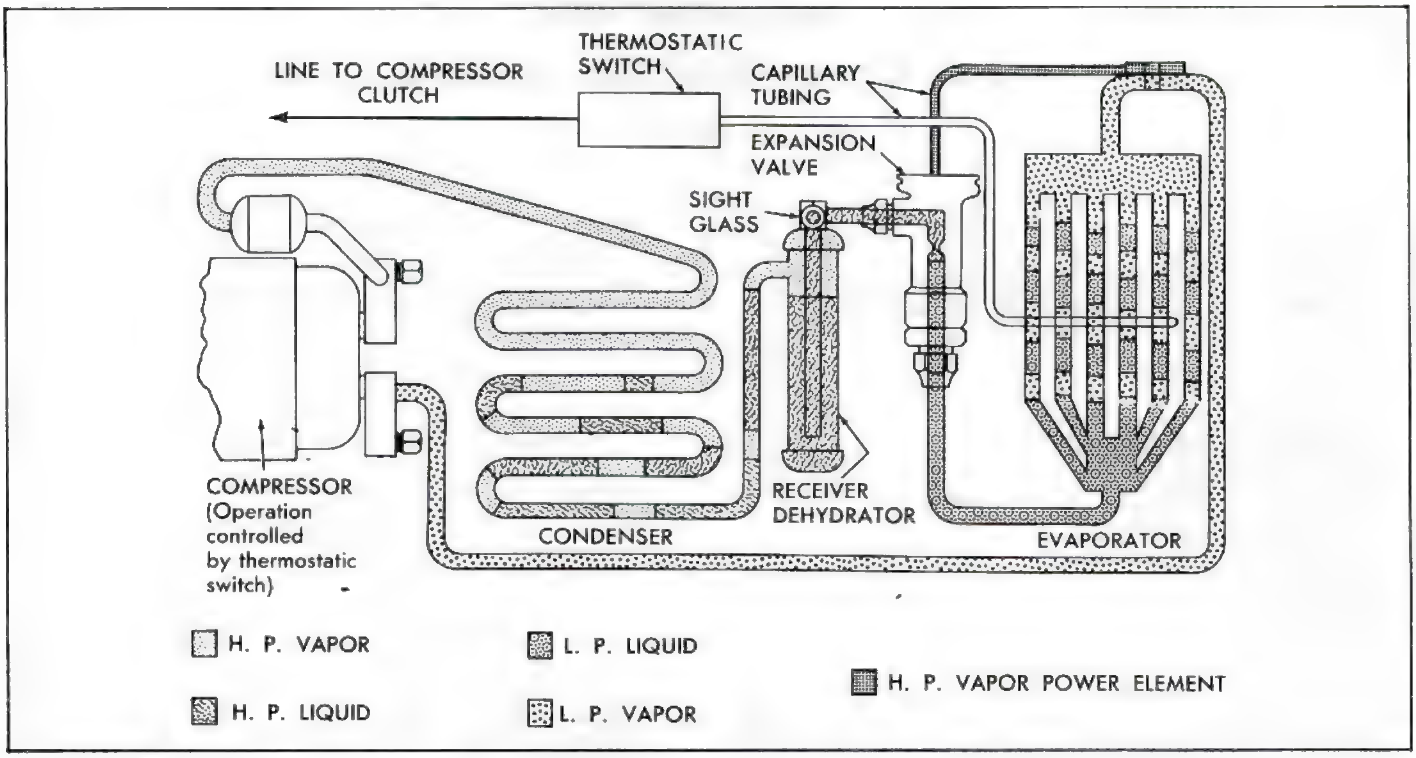


Fig. 10—Cycle of Operation—Corvair Air Conditioning

The 1965 Corvair All-Weather Air Conditioning System operates on either full outside air, full inside (recirculated) air or a blend of both.

The evaporator is located beneath the dash with cold air hoses running to outlets in the center and at both ends of the dash panel. For added quietness, the blower is mounted in the luggage compartment.

Air flow enters the car through an adjustable barrel outlet located in the center of the instrument panel, and adjustable ball outlets on each end of the instrument panel. These ball outlets are reversible, providing spot cooling when turned one way, diffused air flow when reversed. All three outlets may be completely shut off when desired.

Temperature control is by means of a thermostatic switch, located on the evaporator case, which controls the operation of the compressor cycling clutch.

Other system components remain much the same as in previous Corvair Air Conditioning Systems.

Hose clamp connections are used throughout the system.

Two 3AG-AGC 15 ampere fuses, located in in-line connectors mounted behind the instrument panel lower flange and to the left of the radio cover protect:

1. The compressor clutch and low and medium blower speed circuits.
2. The high blower speed circuit.

GENERAL INFORMATION

In any vocation or trade, there are established procedures and practices that have been developed after many years of experience. In addition, occupational hazards may be present that require the observation of certain precautions or use of special tools and equipment. Observing the procedures, practices and precautions of servicing refrigeration equipment will greatly reduce the possibilities of damage to the customers' equipment as well as virtually eliminate the element of hazard to the serviceman.

PRECAUTIONS IN HANDLING REFRIGERANT-12

Refrigerant-12 is transparent and colorless in both the gaseous and liquid state. It has a boiling point of 21.7°F below zero and, therefore, at all normal temperatures and pressures it will be a vapor. The vapor is heavier than air and is noninflammable, nonexplosive, nonpoisonous (except when in contact with an open flame) and noncorrosive (except when in contact with water). The following precautions in handling R-12 should be observed at all times:

- All refrigerant drums are shipped with a heavy metal screw cap. The purpose of the cap is to protect the valve and safety plug from damage. It is good practice to replace the cap after each use of the drum.
- If it is ever necessary to transport or carry a drum or can of refrigerant in a car, keep it in the luggage compartment. Refrigerant should not be exposed to the radiant heat from the sun for the resulting increase in pressure may cause the safety plug to release or the drum or can to burst.
- Drums or disposable cans should never be subjected to high temperature when adding refrigerant to the system. In most instances, heating the drum or can is

required to raise the pressure in the container higher than the pressure in the system during the operation. It would be unwise to place the drum on a gas stove, radiator or use a blow torch while preparing for the charging operation, for a serious accident can result. Don't depend on the safety plug—many drums have burst when the safety plug failed. Remember, pressure can be a powerful force. A bucket of warm water, not over 125°F, or warm wet rags around the container is all the heat that is required.

- Do not weld or steam clean on or near the system. Welding or steam cleaning can result in a dangerous pressure buildup in the system.
- When filling a small drum from a large one, never fill the drum completely. Space should always be allowed above the liquid for expansion. If the drum were completely full and the temperature was increased, hydraulic pressure with its tremendous force would result.
- Discharging large quantities of Refrigerant-12 into a room can usually be done safely as the vapor would produce no ill effects; however, in the event of an accidental rapid discharge of the system, it is recommended that inhalation of large quantities of R-12 be avoided. This caution is very important if the area contains a flame producing device such as a gas heater. While R-12 normally is nonpoisonous, heavy concentrations of it in contact with a live flame will produce a toxic gas. The same gas will also attack all bright metal surfaces.
- Protection of the eyes is of vital importance! When working around a refrigerating system, an accident may cause liquid refrigerant to hit the face. If the eyes are protected with goggles or glasses, no serious damage can result. Just remember, any R-12 liquid that you can touch or that touches you is at least 21.7°F. below zero. The eyeballs can't take much of this temperature. If R-12 liquid should strike the eyeballs, here is what to do:
  1. Keep calm.
  2. Do not rub the eyes! Splash the affected area with quantities of cold water to gradually get the temperature above the freezing point. The use of mineral, cod liver or an antiseptic oil is important in providing a protective film to reduce the possibility of infection.
  3. As soon as possible, call or consult an eye specialist for immediate and future treatment.

  REMEMBER—"An ounce of prevention is worth a pound of cure."

PRECAUTIONS IN HANDLING REFRIGERANT LINES

- All metal tubing lines should be free of kinks, because of the restriction that kinks will offer to the flow of refrigerant. The refrigeration capacity of the entire system can be greatly reduced by a single kink.
- The flexible hose lines should never be bent to a radius of less than 10 times the diameter of the hose.
- The flexible hose lines should never be allowed to come within a distance of 2-1/2" of the exhaust manifold.
- Flexible hose lines should be inspected at least once a year for leaks or brittleness. If found brittle or leaking they should be replaced with new lines.
- Use only sealed lines from parts stock.
- When disconnecting any fitting in the refrigeration system, the system must first be discharged of all refrigerant. However, proceed very cautiously regardless of gauge readings. Open very slowly, keeping face and hands away so that no injury can occur if there happens to be liquid refrigerant in the line. If pressure is noticed when fitting is loosened, allow it to bleed off very slowly.

  CAUTION: Always wear safety goggles when opening refrigerant lines.

- In the event any line is opened to atmosphere, it should be immediately capped to prevent entrance of moisture and dirt.
- The use of the proper wrenches when making connections on "O" ring fittings is important. The use of improper wrenches may damage the connection. The opposing fitting should always be backed up with a wrench to prevent distortion of connecting lines or components. When connecting the flexible hose connections it is important that the swaged fitting and the flare nut, as well as the coupling to which it is attached, be held at the same time using three different wrenches to prevent turning the fitting and damaging the ground seat.
- "O" rings and seats must be in perfect condition. The slightest burr or piece of dirt may cause a leak.
- Sealing beads on "O" ring connections must be free from nicks and scratches to assure a perfect seal.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The metal internal parts of the Chevrolet refrigeration system and the refrigerant and oil contained in the system are designed to remain in a state of chemical stability as long as pure R-12 plus refrigeration oil is used in the system.

However, when abnormal amounts of foreign materials, such as dirt, air or moisture are allowed to enter the system, the chemical stability may be upset. When accelerated by heat, these contaminates may form acids and sludge and eventually cause the breakdown of components within the system. In addition, contaminates may affect the temperature—pressure relationship of R-12, resulting in improper operating temperature and pressures and decreased efficiency of the system.

The following general practices should be observed to insure chemical stability in the system.

- Whenever it becomes necessary to disconnect a refrigerant or gauge line, it should be immediately capped. Capping the tubing will also prevent dirt and foreign matter from entering.
- Tools should be kept clean and dry. This also includes the gauge set and replacement parts.
- When adding oil, the container should be exceptionally clean and dry due to the fact that the refrigeration oil in the container is as moisture-free as it is possible to make it. Therefore, it will quickly absorb any moisture with which it comes in contact. For this same reason the oil container should not be opened until ready for use and then it should be capped immediately after use.
- When it is necessary to open a system, have everything you will need ready and handy so that as little time as possible will be required to perform the operation.

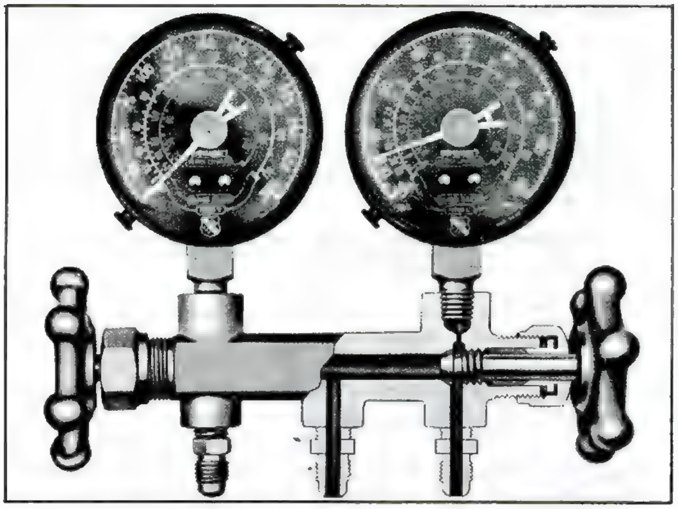


Fig. 11—Gauge Set

Don't leave the system open any longer than is necessary.

- Finally, after the operation has been completed and the system sealed again, air and moisture should be evacuated from the system before recharging.

GAUGE SET

The gauge set (fig. 11) is used when purging, evacuating, charging or diagnosing trouble in the system. The gauge at the right is known as the low pressure gauge. The face is graduated into pounds of pressure from 0 to 150 and, in the opposite direction, in inches of vacuum from 0 to 30 inches. This is the gauge that should always be used in checking pressures on the low pressure side of the system. When all parts of the system are functioning properly the refrigerant pressure on the low pressure side never falls below 0 pounds pressure. However, several abnormal conditions can occur that will cause the low pressure to fall into a partial vacuum. Therefore, a low pressure gauge is required.

The high pressure gauge is used for checking pressures on the high pressure side of the system.

The connection at the left is for attaching the low pressure gauge line and the one at the right the high pressure gauge line. The center connector is common to both and is for the purpose of attaching a line for adding refrigerant, discharging refrigerant, evacuating the system and other uses. When not required, this line or connection should be capped.

> **NOTE:** Gauge fitting connections should be installed hand tight only and the connections leak tested before proceeding.

The hand shutoff valves on the gauge manifold do not control the opening or closing off of pressure to the gauges. They merely close each opening to the center connector and to each other. During most diagnosing and service operations, the valves must be closed. The only occasion for opening both at the same time would be to bypass refrigerant vapor from the high pressure to the low pressure side of the system, or in evacuating both sides of the system.

J-8393 REFRIGERANT CHARGING STATION

The J-8393 Charging Station is a portable assembly of a vacuum pump, refrigerant supply, gauges, valves, and most important, a five (5) pound metering refrigerant charging cylinder. The use of a charging cylinder eliminates the need for scales, hot water pails, etc.

The chief advantage of this unit is savings. A very definite savings in refrigerant and time can be obtained by using this unit. Since the refrigerant is metered into the system by volume, the correct amount may be added to the system and charged to the customer. This, coupled with the fact that the unit remains "plumbed" at all times and thus eliminates loss of refrigerant in purging of lines and hooking-up, combines to enable the operator to get full use of all refrigerant purchased by the dealership.

All evacuation and charging equipment is hooked together in a compact portable unit (fig. 12) which nearly anyone can use to do an adequate job of servicing a car air conditioner. It brings air conditioning service down to the basic problem of hooking on two hoses, and manipulating clearly labeled valves.

This will tend to insure that the job will be done without skipping operations. As a result, you can expect to save time and get higher quality work, less chance of an over or undercharge, or comeback.

The pump mount is such that the dealer may use his own vacuum pump. The gauges and manifold are in common use. Thus a current air conditioning dealer can use the equipment on hand and avoid duplication.

LEAK TESTING THE SYSTEM

Whenever a leak is suspected in the system or a service operation performed which results in disturbing lines or connections, it is advisable to test for leaks.

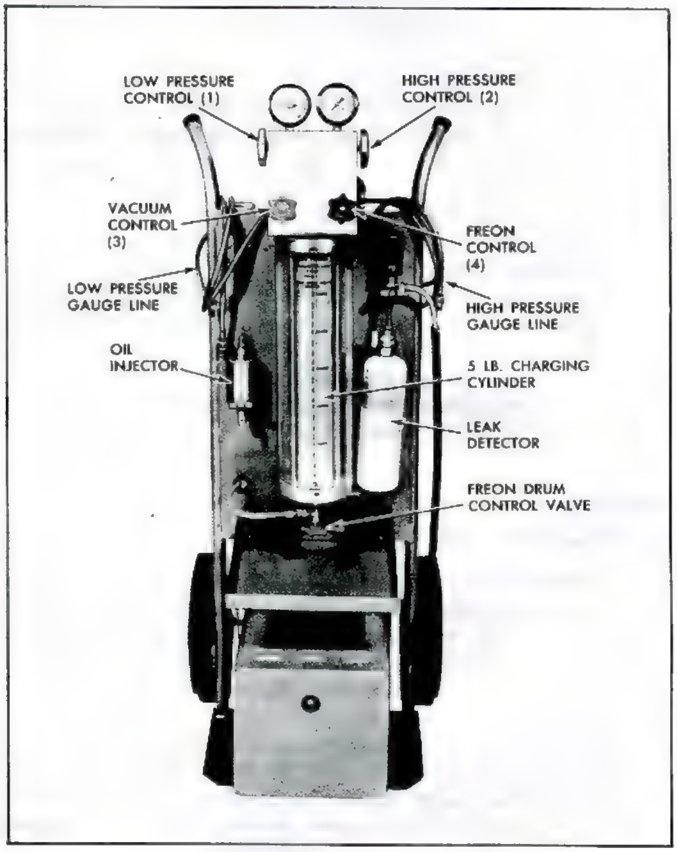


Fig. 12—J-8393 Charging Station

Common sense should be the governing factor in performing any leak test, since the necessity and extent of any such test will, in general, depend upon the nature of the complaint and the type of service performed on the system. It is better to test and be sure, if in doubt, than to risk the possibility of having to do the job over again.

Leak Detector

Tool J-6084 (fig. 13) is a propane gas-burning torch which is used to locate a leak in any part of the Refrigerant system. R-12 gas drawn into the sampling tube attached to the torch will cause the torch flame to change color in proportion to the size of the leak. Propane gas fuel cylinders used with the torch are readily available commercially throughout the country.

CAUTION: Do not use lighted detector in any place where combustible or explosive gases, dusts or vapors may be present.

Operating Detector

1. Open control valve only until a low hiss of gas is heard, then light gas at opening in chimney.
2. Adjust flame until desired volume is obtained. This is most satisfactory when blue flame is approximately 3/8" above reaction plate. The reaction plate will quickly heat to a cherry red.
3. Explore for leaks by moving the end of the sampling hose around possible leak points in system. Do not pinch or kink the hose.

   NOTE: Since R-12 is heavier than air, it is good practice to place open end of sampling tube immediately below point being tested, particularly in cases of small leaks.

   CAUTION: Do not breathe the fumes that are produced by the burning of R-12 gas in the detector flame, since such fumes can be toxic in large concentrations of refrigerant.

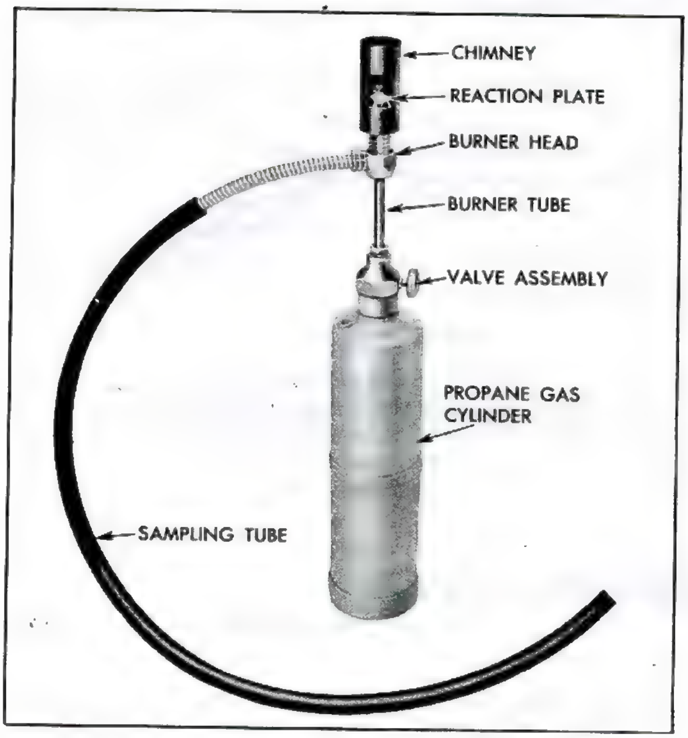


Fig. 13—Leak Detector

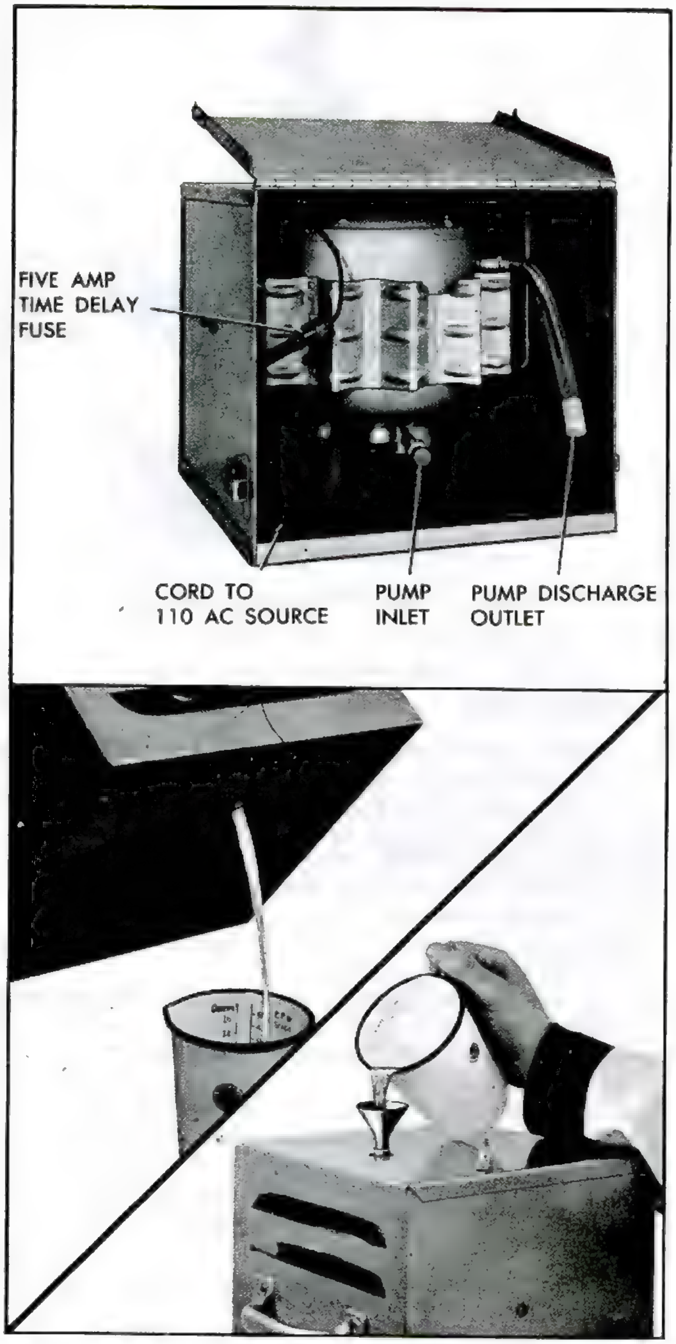


Fig. 14—Vacuum Pump

4. Watch for color changes. The color of the flame which passes through the reaction plate will change to yellow when sampling hose draws in very small leaks of refrigerant. Large leaks will be indicated by a change in color to a vivid purplish-blue. When the sampling hose passes the leak, the flame will clear to an almost colorless pale-blue again.

   NOTE: If the flame remains yellow when unit

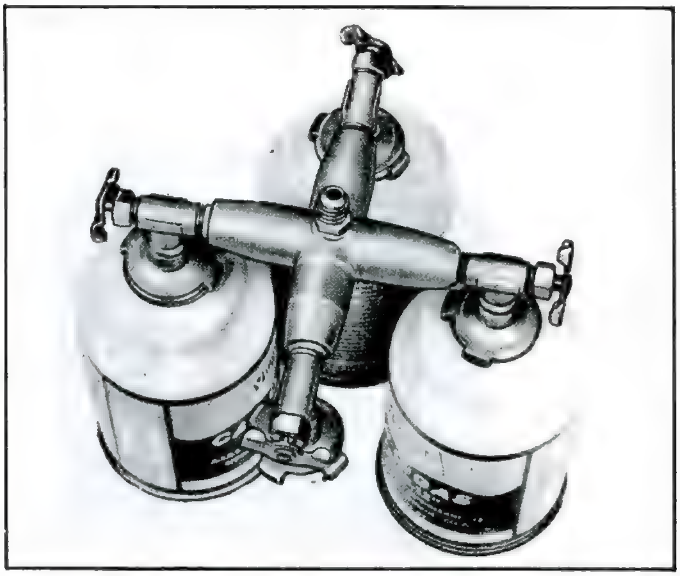


Fig. 15—R-12 Disposable Cans and Valve

is removed from leak, insufficient air is being drawn in or the reaction plate is dirty.

VACUUM PUMP

A vacuum pump should be used for evacuating air and moisture from the air conditioning system.

Vacuum pump, Tool J-5428, (fig. 14) is available for this purpose. It is used as a component part of the Charging Station J-8393, described previously. The following precautions should be observed relative to the operation and maintenance of this pump.

- Make sure dust cap on discharge outlet of vacuum pump is removed before operating.
- Keep all openings capped, when not in use to avoid moisture being drawn into the system.
- Oil should be changed after every 250 hours of normal operation.

  To change oil, simply unscrew hex nut located on back side of pump, tilt backward and drain out oil (fig. 14). Recharge with 8 ounces of vacuum pump oil Frigidaire 150 or equivalent (fig. 14). If you desire to flush out the pump, use this same type clean oil. Do not use solvent.

  NOTE: Improper lubrication will shorten the life of pump.

- If this pump is subjected to extreme or prolonged cold, allow it to remain indoors until oil has reached approximate room temperature. Failure to warm oil will result in a blown fuse.
- A five ampere time delay cartridge fuse has been installed in the common line to protect the windings of the compressor. The fuse will blow if an excessive load is placed on the pump. In the event the fuse is blown, replace with a five ampere time delay fuse - do not use a substitute fuse as it will result in damage to the starting windings.
- If the pump is being utilized to evacuate a burnt-out system, a filter must be connected to the intake fitting to prevent any sludge from contaminating the working parts, which will result in malfunction of the pump.
- Do not use the vacuum pump as an air compressor.

AVAILABLITY OF REFRIGERANT-12

Refrigerant-12 is available through Parts Stock in 25 lb. drums and in 15 oz. disposable cans. Valves are available for the disposable cans, which may be used as individual cans or as a group of up to four cans (fig. 15).

Tool J-6272 is used with one through four cans. The use of the four-can fixture makes it possible to charge the system with a known quantity of refrigerant without the use of weighing equipment necessary with the larger drum. The single can Valve J-6271 can be used for completing the charge and for miscellaneous operations such as flushing. The valves are installed by piercing the top seal of the cans.

Evacuating and charging procedures later in this section will make use of the J-8393 Charging Station which uses the 25 lb. drum of R-12.

COMPRESSOR OIL

Special refrigeration lubricant should be used in the system. It is available in 1 quart graduated bottles through Parts Stock. This oil is as free from moisture and contaminants as it is possible to attain by human processes. This condition should be preserved by immediately capping the bottle when not in use.

See "Air Conditioning System Capacities" for the total system oil capacity.

Due to the porosity of the refrigerant hoses and connections, the system refrigerant level will show a definite drop after a period of time. Since the compressor oil is carried throughout the entire system mixed with the refrigerant, a low refrigerant level will cause a dangerous lack of lubrication. Therefore, the refrigerant charge in the system has a definite tie-in with the amount of oil found in the compressor and an insufficient charge may eventually lead to an oil buildup in the evaporator.

COMPRESSOR SERIAL NUMBER

The compressor serial number is located on the serial number plate on top of the compressor. The serial number consists of a series of numbers and letters (Example: 10-CC-001). This serial number should be referenced on all forms and correspondence related to the servicing of this part.

INSPECTION AND PERIODIC SERVICE

PRE-DELIVERY INSPECTION

1. Check the belt for proper tension.
2. With controls positioned for operation of the system, operate the unit for ten minutes at approximately 2000 rpm. Observe the clutch pulley bolt to see that the compressor is operating at the same speed as the clutch pulley. Any speed variation indicates clutch slippage.
3. Check the sight glass to see that the unit has a sufficient refrigerant charge. The glass should be clear, although during milder weather it may show traces of bubbles. Foam in the flow indicates a low

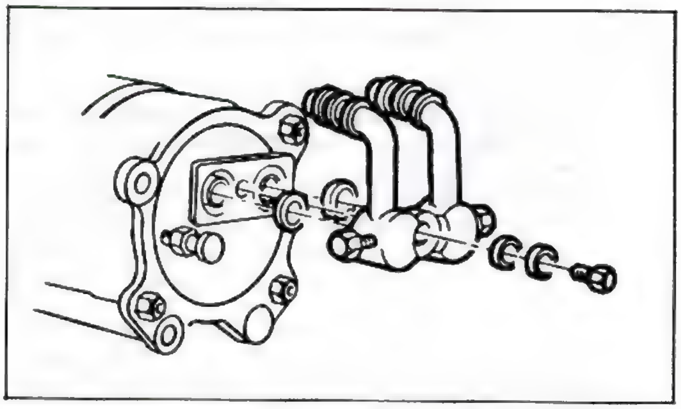


Fig. 16—Compressor Connector

charge. No liquid visible indicates no charge.

4. Check hose clamp connections (see "Hose Clamps" under "System Service Operations") and leak test the complete system.
5. If there is evidence of an oil leak, check the compressor to see that the oil charge is satisfactory.
6. Check the system controls for proper operation.

6000 MILE INSPECTION

1. Check unit for any indication of a refrigerant leak.
2. If there is an indication of an oil leak, check compressor for proper oil charge.
3. Check sight glass for proper charge of Refrigerant-12.
4. Tighten the compressor brace and support bolts and check the belt tension.
5. Check hose clamp connections. See "Hose Clamps" under "System Service Operations".
6. Check thermostatic switch setting.

PERIODIC SERVICE

- Inspect condenser regularly to be sure that it is not plugged with leaves or other foreign material.
- Check evaporator drain tubes regularly for dirt or restrictions.
- At least once a year, check the system for proper refrigerant charge and the flexible hoses for brittleness, wear or leaks.
- Every 6000 miles check sight glass for low refrigerant level.
- Check belt tension regularly.
- Every week - during winter months or other periods when the system is not being operated regularly - run the system, set for maximum cooling, for 10 or 15 minutes to insure proper lubrication of seals and moving parts.

INSTALLING GAUGE SET TO CHECK SYSTEM OPERATION

1. Install Gauge Adapter J-5420 onto the high pressure hose of the gauge set and J-9459 Gauge Adapter on the low pressure hose.
2. With the engine stopped, remove the caps from the cored valve gauge fittings on the compressor connector (See Figure 16).
3. Connect the gauge line adapters to the threaded fittings on the compressor connector.

PERFORMANCE TEST

This test may be conducted to determine if the system is performing in a satisfactory manner and should be used as a guide by the serviceman in diagnosing trouble within the system The following fixed conditions must be adhered to in order to make it possible to compare the performance of the system being tested with the standard below:

1. Doors and windows closed.
2. Engine compartment lid up.
3. Large fan at the left side of vehicle just above rear fender level so that during tests fan air stream flows across top of condenser toward the right side of the vehicle.
4. Vehicle in NEUTRAL with engine running at 2000 rpm.
5. Air Conditioning controls set for—
   a. Maximum cooling.
   b. High blower speed.
   c. Full inside air.
6. Heater off.
7. Gauge set installed.
8. System settled out (run-in approximately 10 minutes).
9. A thermometer placed in the right hand diffuser outlet.

The following Performance Data define normal operation of the system under the above conditions. Relative humidity does not appear in the tables because after running the prescribed length of time on recirculated air and maximum cooling, the relative humidity of the air passing over the evaporator core will remain at approximately 35% to 40% regardless of the ambient temperature or humidity.

Grille Air Temperature	70°	80°	90°	100°	110°	120°
Engine rpm	2000					
Compressor Head Pressure*	150-160	165-175	205-215	220-230	265-275	295-305
Compressor Suction Pressure*	10	11	13	14	17	19
Discharge Air Temp. at R/H Outlet*	34-40	36-41	38-43	38-43	39-44	40-45

*When compressor clutch disengages.

MAINTENANCE AND ADJUSTMENTS

THERMOSTATIC SWITCH

Some adjustment is possible on this switch, located on the evaporator housing, in the event that an otherwise properly operating switch is not maintaining the proper suction pressure shown in the Performance Test chart. The adjustment screw is located beneath the fiber cover on the end of the switch opposite the thermostatic element.

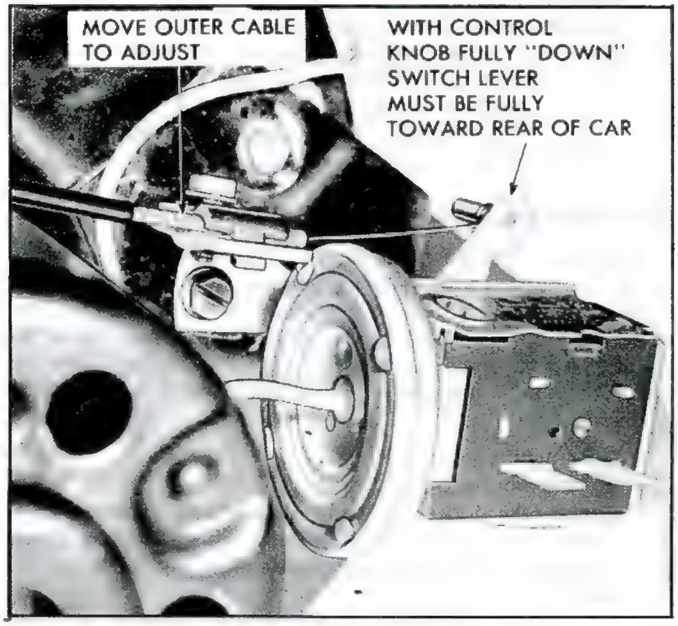


Fig. 17—Thermostatic Switch Cable Adjustment

Check and Adjustment

1. Before attempting to adjust the thermostatic switch, check to be sure that the adjustment lever on the switch is in maximum COLD position (moved fully toward the rear of the car) when the COLD control knob on the control panel is pushed fully down. Re-adjust the bowden cable, if necessary (fig. 17). Then, if system still fails the performance test, proceed as follows:
2. Install the gauge set and set up vehicle as shown under "Performance Test".
3. Carefully remove the fiberboard cover. Using a small screw driver, turn the adjustment screw (fig. 18) back and forth to check its performance. Use of a small mirror may aid in locating the adjustment screw.
   - If compressor continues to operate regardless of the screw adjustment, it indicates that the points are fused which will lead to evaporator freeze-up. Replace the switch.
   - If the compressor does not operate regardless of the position of the switch, a loss of thermostat bellows action is indicated. Replace the switch.
   - Check the screw threads for stripped or otherwise damaged threads.
4. The suction side of the system, read on the low pressure gauge, should pull down to the pressure shown in the Performance Test chart, under the appropriate ambient air temperature heading.

   NOTE: Providing that a fan is utilized as in Step 3 of "Performance Test," ambient air temperature will be considered the temperatue of the shop at the time the switch is being set.

5. If, at the end of each cooling cycle, the low side has pulled down lower than the prescribed pressure, turn the adjusting screw clockwise in single turn increments until the suction pressure rises to the correct pressure.
6. If the pressure is more than it should be, turn the adjusting screw counter-clockwise until the proper pressure is reached.

   CAUTION: When checking and adjusting this valve, make certain that the adjustment lever is being held in the fully forward position described in Step 1 above.

7. After adjusting the switch, observe the operation of the system for several minutes. Then if the operation is satisfactory, remove the gauge set.
8. Replace the fiberboard cover over the adjustment screw. Check to see that the bowden cable is still in

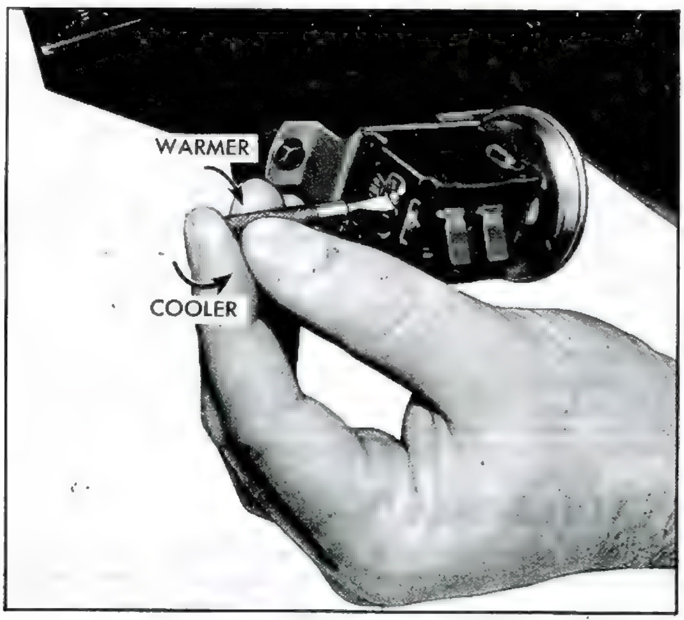


Fig. 18—Thermostatic Switch Adjustment

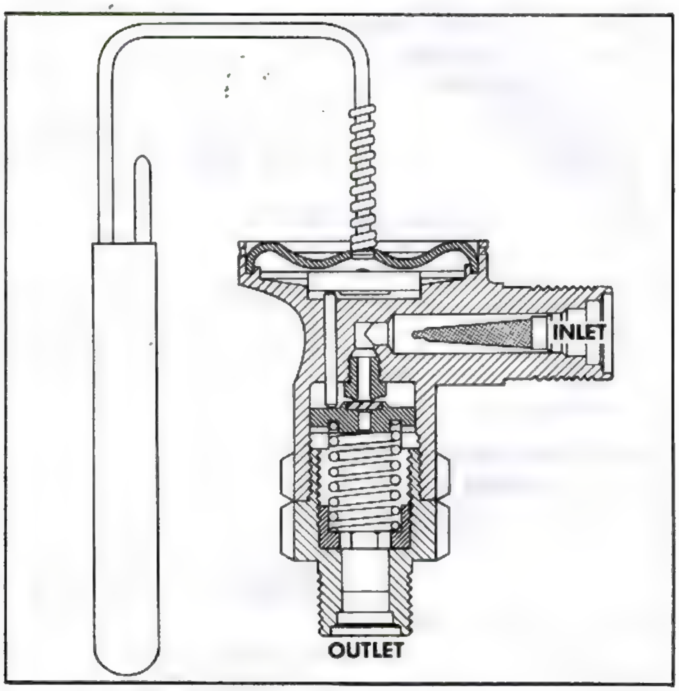


Fig. 19—Expansion Valve Cross Section

proper adjustment (lever toward rear of car when COOL control is fully down).

EXPANSION VALVE

A malfunction of the expansion valve (fig. 19) will be caused by one of the following conditions: valve stuck open, valve stuck closed, broken power element, a restricted screen or an improperly located or installed power element bulb. The first three conditions require valve replacement. The last two may be corrected by replacing the valve inlet screen and by properly installing the power element bulb.

Indications of expansion valve trouble provided by the Performance Test are as follows:

Valve Stuck Open or Broken Power Element
- High Suction Pressure and High Head Pressure.
- Noisy Compressor.
- Poor Cooling—Freeze Up.

Valve Stuck Closed or Plugged Screen
- Very Low Suction Pressure.
- No Cooling.

Poorly Located Power Element Bulb
- Normal Pressures.
- Poor Cooling.

SYSTEM SERVICE OPERATIONS

1965 CORVAIR ALL-WEATHER AIR CONDITIONING SYSTEM CAPACITIES

Refrigerant Charge	5 lbs. or 5 Cans
Oil Charge	11 oz. of 525 Viscosity Oil

REFRIGERANT LINE CONNECTIONS

"O" Rings

These procedures must be followed when "O" ring connectors are serviced.

Always replace the "O" ring when a connection has been broken. When replacing the "O" ring, first dip it in refrigeration oil. Always use a backing wrench on "O" ring fittings to prevent the hose from twisting and damaging the "O" ring. Do not overtighten. Correct torque specifications are as follows:

Metal Tube O.D.	Thread and Fitting Size	Steel Tubing Torque*	Alum. Tubing Torque*
1/4	7/16	10-15	5-7
3/8	5/8	30-35	11-13
1/2	3/4	30-35	11-13
5/8	7/8	30-35	18-21
3/4	1-1/16	30-35	23-28

*Foot Pounds

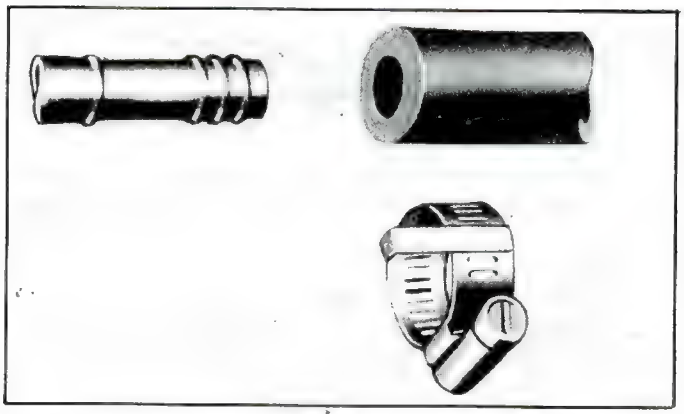


Fig. 20—Hose, Clamp and Fitting

NOTE: Where steel to aluminum connections are being made, use torque for aluminum fittings.

Hose Clamps

With the exception of the adapter at the expansion valve inlet which has an "O" ring fitting, all hose connections are of the hose clamp type. Special procedures are necessary for both installation and removal.

NOTE: All hose clamps must be tightened after the first 6000 miles of operation. Torque a new hose clamp connection to 30-38 lbs. in. When checking a connection, any torque above 10 lbs. in. is satisfactory. If torque has fallen below 10 lbs. in., retorque to 20-25 lbs. in. Visual evidence of overtorquing may be noted as a "feathering" of the rubber hose cover through the notches of the clamp.

CAUTION: Do not overtorque.

Installation

1. Coat tube and hose with refrigeration oil.
2. Carefully insert hose over the three beads on the fitting and down as far as the fourth, or locating, bead. Hose must butt against this fourth bead.

   CAUTION: Use no sealer of any kind.

3. Install clamps on hose, hooking the locating arm over the cut end of the hose.
4. Tighten the hose clamp screw with a large screw driver as directed in the note above.

Removal

1. Carefully, with a sharp knife, make an angle cut in the hose as shown in Figure 21. This should loosen the hose so that it may be worked off the fitting.

   CAUTION: Use extreme care that the fitting is not scored by the knife when performing this operation. Such damage will lead to future refrigerant leaks. Cutting the hose lengthwise may result in this problem.

2. Cut off slit end of hose when reinstalling. Reinstall as described above.

   CAUTION: Use only approved refrigeration hose. Never use heater hose.

REPAIR OF REFRIGERANT LEAKS

Any refrigerant leaks found in the system should be repaired in the manner given below:

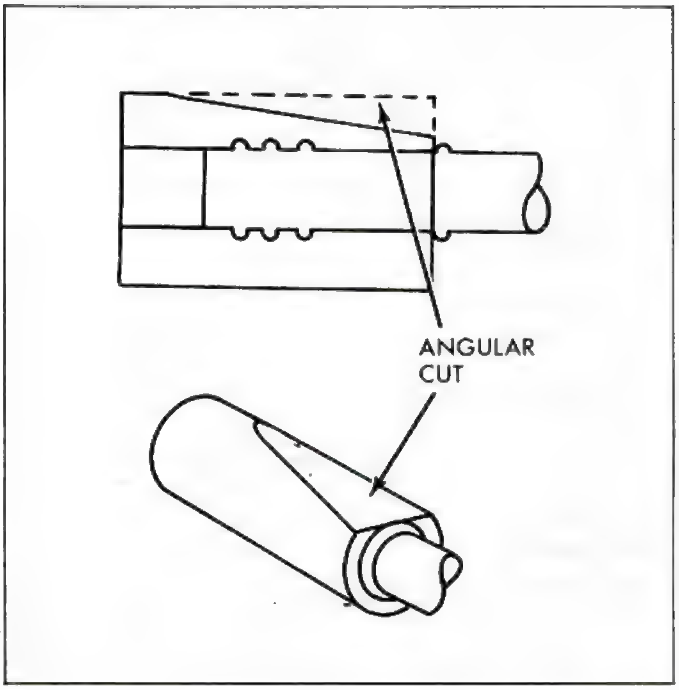


Fig. 21—Recommended Hose Removal Procedure

Leaks at "O" Ring Connection

1. Check the torque on the fitting and, if too loose, tighten to the proper torque. Always use a backing wrench to prevent twisting and damage to the "O" ring. Do not overtighten. Again leak test the joint.
2. If the leak is still present, discharge the refrigerant from the system as described under "Evacuating and Charging Procedures".
3. Inspect the "O" ring and the fitting and replace if damaged in any way. Coat the "O" ring being reinstalled with refrigeration oil and install carefully.
4. Retorque the fitting, using a backing wrench, and then add 1/2 to 1 lb. of R-12 to the system and recheck for leaks.

   CAUTION: Do not operate the system with this small refrigerant charge.

5. Purge the system, thus removing the 1/2 to 1 lb. installed in Step 4 above.
6. Evacuate and charge the system.

Leaks at Hose Clamp Connection

1. Check the tightness of the clamp itself and tighten if necessary. Recheck for leak.
2. If leak has not been corrected discharge the system and loosen clamp and remove hose from connection. Inspect condition of hose and connector. Replace scored or damaged parts.
3. Dip end of new hose in refrigerant oil and carefully reinstall over connector. Never push end of hose beyond the locating bead. Properly torque the clamp.
4. Recheck the system for leaks by installing 1/2 to 1 lb. of R-12 into the system. Do not run compressor.
5. Purge the system, thus removing the 1/2 to 1 lb. installed in Step 4 above.
6. Evacuate and charge the system.

Compressor Leaks

If leaks are located around the compressor shaft seal or shell, replacement of necessary seals should be made as outlined under "Compressor".

REFRIGERANT HOSE FAILURE

After a leak or rupture has occurred in a refrigerant hose, or if a fitting has loosened and caused a considerable loss of refrigerant and oil, the entire system should be flushed and recharged after repairs have been made. If the system has been open to atmosphere for any prolonged period of time the receiver-dehydrator should be replaced.

CONDITIONING SYSTEM FOR REPLACEMENT OF COMPONENT PARTS

Air conditioning, like many other things, is fairly simple to service once it is understood. However, there are certain procedures, practices and precautions that should be followed to prevent costly repairs, personal injury or damage to equipment. For this reason it is strongly recommended that the preceding information in this section be studied thoroughly before attempting to service the Corvair System.

Great emphasis must be placed on keeping the system clean. Use plugs or caps to close system components and hoses when they are opened to the atmosphere. Keep your work area clean.

In removing and replacing any part in the refrigeration system, the following operations, which are described in this section must be performed in the sequence shown.

1. Purge the system by releasing the refrigerant to the atmosphere.
2. Remove and replace the defective part.
3. Charge the system with R-12.

   CAUTION: Always wear protective goggles when working on refrigeration systems. Goggles J-5453 are included in the set of air conditioning special tools. Also, beware of the danger of carbon monoxide fumes by avoiding running the engine in closed or improperly ventilated garages.

PURGING THE SYSTEM

In replacing any of the air conditioning components the system must be completely purged or drained of refrigerant. The purpose is to lower the pressure inside the system so that a component part can be safely removed.

1. With engine stopped install high and low pressure lines of gauge set to high and low pressure gauge outlets on compressor (see Installing Gauge Set to Check System Operation).
2. With plug removed from the centerline on the gauge manifold, open high pressure gauge valve and discharge the vapor slowly through the center connection.

   CAUTION: Do not open valves too much or compressor oil may be discharged with the refrigerant. A rag wrapped around the end of the center gauge line will prevent the splashing of oil in the event of accidental rapid discharge.

3. When the pressure is reduced to below 100 pounds on

the high pressure gauge, open the low pressure gauge valve and continue discharging until all refrigerant has been released or the pressure does not exceed 5 pounds. Close both gauge valves.

The complete system has now been purged of refrigerant and any part in the system can be replaced.

EVACUATING AND CHARGING THE SYSTEM

GENERAL NOTE: In all evacuating procedures shown below, the specification of 26-28 inches of Mercury vacuum is used. These figures are only attainable at or near Sea Level Elevation. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. Example: at 5000 ft. elevation, only 21 to 23 inches of vacuum can normally be obtained.

Whenever the air conditioning system is opened for any reason, it should not be put into operation again until it has been evacuated to remove air and moisture which may have entered the system.

The following procedures are based on the use of the J-8393 Charging Station.

Filling Charging Cylinder

1. Open control valve on refrigerant drum.
2. Open valve on bottom of charging cylinder allowing refrigerant to enter cylinder.
3. Bleed cylinder refrigerant valve on top (behind control panel) as required to allow refrigerant to enter. When refrigerant reaches desired level (see "Air Conditioning System Capacities") close valve at bottom of cylinder and be certain bleed valve is closed securely.

   NOTE: It will be necessary to close bleed valve periodically to allow boiling to subside to check level in sight glass.

Installing Charging Station to System

1. Be certain all valves on charging station are closed.
2. Connect high pressure gauge line to high pressure gauge fitting. (See "Installing Gauge Set to Check System Operations.")
3. See Figure 22. Turn high pressure control (2) one turn counter-clockwise (open). Crack open low pressure control (1) and allow refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting on compressor.
4. System is now ready for performance testing.

Evacuating and Charging System

1. Install charging station as previously described. Refer to Figure 22 while performing the following operation.
2. Remove Low Pressure gauge line from compressor.

   NOTE: Remove the adapter from the gauge fitting.

3. Crack open high (2) and low (1) pressure control valves, and allow refrigerant gas to purge from system. Purge slow enough so that oil does not escape from system along with refrigerant.

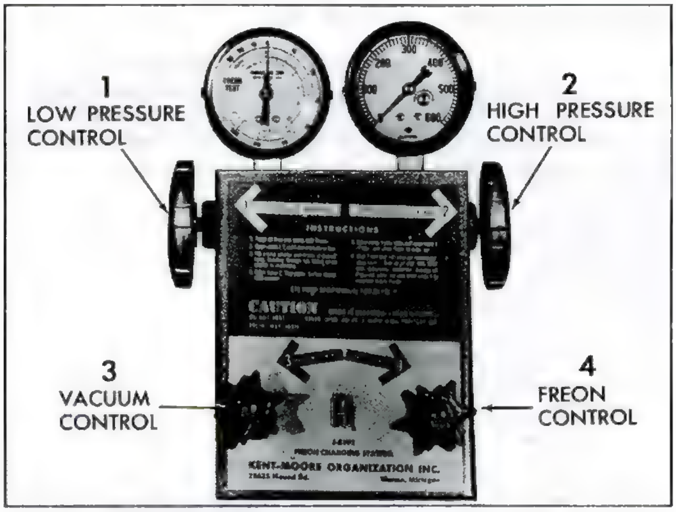


Fig. 22—Charging Station Controls

4. When refrigerant flow nearly stops, connect Low Pressure gauge line to compressor.
5. Turn on vacuum pump and open Vacuum Control Valve (3).
6. With system purged as above, run pump until 28-29 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 28-29 inches vacuum.
7. If 28-29 inches cannot be obtained, close Vacuum Control Valve (3) and shut off vacuum pump. Open refrigerant Control Valve (4) and allow 1/2 pound of Freon to enter system. Locate and repair all leaks.
8. After evacuating for 15 minutes, add 1/2 pound of refrigerant to system as described in Step 7 above. Purge this 1/2 pound and reevacuate for 5 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.
9. Only after evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to the proper level.
10. Close Low-Pressure valve (1). Fully open refrigerant Control Valve (4) and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system, turn off refrigerant Control Valve (4) and close hand shut-off valves.
11. If full charge of refrigerant will not enter system in Step 3 above, close high pressure control, and refrigerant Control Valve (4). Start engine and run at slow idle with compressor operating. Crack refrigerant Control Valve (4) and Low Pressure Control (1). Watch low side gauge and keep gauge below 50 psi by regulating refrigerant Control Valve (4). Closing valve will lower pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant Control Valve (4) and close Low Pressure Control (1).
12. System is now charged and should be performance tested before removing gauges.

CHECKING AND ADDING OIL

Compressors are originally fully charged with 10 oz. of Special Frigidaire 525 viscosity refrigeration oil. Design and configuration of the six cylinder compressor require a radical departure from the oil checking procedure used on the five cylinder compressor in past years.

In the six cylinder compressor it is not recommended that the oil be checked as a matter of course. Generally, compressor oil level should be checked only where there is evidence of a major loss of system oil such as might be caused by:

- A broken refrigerant hose.
- A severe hose fitting leak.
- A very badly leaking compressor seal.
- Collision damage to the system components.

As a quick check on compressor oil charge, with the engine off, carefully crack open the oil drain plug on the bottom of the compressor. If oil comes out, the compressor has the required amount of oil.

To further check the compressor oil charge, should the above test show insufficient oil, it is necessary to remove the compressor from the vehicle, drain and measure the oil.

Checking Compressor Oil Charge

1. Run the system for 10 minutes at 500-600 engine rpm with controls set for maximum cooling and high blower speed.
2. Turn off engine, discharge the system, remove compressor from vehicle, place it in a horizontal position with the drain plug downward. Remove the drain plug and, tipping the compressor back and forth and rotating the compressor shaft, drain the oil into a clean container, measure and discard the oil.
3. a. If the quantity drained was 4 fluid oz. or more, add the same amount of new refrigeration oil to the replacement compressor.
   b. If the quantity drained was less than 4 fluid oz., add 6 fluid oz. of new refrigeration oil to the replacement compressor.
   c. If a new service compressor is being installed, drain all oil from it and replace only the amount specified in Steps 3a and above.
   d. If a field repaired compressor is being installed, add an additional 1 fluid oz. to the compressor.
4. In the event that it is not possible to idle the compressor as outlined in Step 1 to effect oil return to it, proceed as follows:
   a. Remove the compressor, drain, measure and discard the oil.
   b. If the amount drained is more than 1-1/2 fluid oz. and the system shows no signs of a major leak, add the same amount to the replacement compressor.
   c. If the amount drained is less than 1-1/2 fluid oz. and the system appears to have lost an excessive amount of oil add 6 fluid oz. of clean refrigeration oil to replacement compressor, 7 fluid oz. to a repaired compressor.

      If the oil contains chips or other foreign material, replace the receiver-dehydrator and flush or replace all component parts as necessary. Add the full 11 fluid oz. of new refrigeration oil to the replacement compressor.
5. Add additional oil in the following amounts for any system components being replaced.

Evaporator	3 fluid oz.
Condenser	1 fluid oz.
Receiver-Dehydrator	1 fluid oz.

   NOTE: When adding oil to the compressor, it will be necessary to tilt the rear end of the compressor up so that the oil will not run out of the suction and discharge parts. Do not set the compressor on the shaft end.

AIR OR EXCESSIVE REFRIGERANT IN THE SYSTEM

This procedure is to be used when a diagnosis indicates either air or excessive refrigerant in the system. When a higher than normal high side operation pressure is encountered, then proceed as previously described under "Purging the System," "Evacuating the System" and "Adding Refrigerant—Complete Charge."

COMPONENT PARTS SERVICE OPERATIONS

EVAPORATOR

Removal from Vehicle (Refer to Fig. 23)

1. Purge the refrigerant from the system.
2. Remove spare tire, the glove box and glove box door.
3. Reaching through the glove box door opening, remove the evaporator air duct hoses.
4. From within the luggage compartment, remove the stud nut and the screw attaching the evaporator assembly to the dash panel.
5. Remove the hose clamp connection from the refrigerant line in the luggage compartment. Cap the line and evaporator connection.

   CAUTION: Even though the refrigerant has been removed from the system, safety goggles should be worn when disconnecting refrigerant lines. Goggles will eliminate the possibility of eye damage from the latent refrigerant in the system.
6. Back within the car, remove the two evaporator bracket to instrument panel flange attaching nuts, bolts, flat washers and lock washers.
7. Carefully lower the evaporator assembly, disconnecting thermostatic switch bowden cable, drain tube and electrical connectors as necessary.
8. Remove the hose clamp connection from the refrigerant line behind the evaporator case. Cap the line and evaporator connection.
9. Remove the evaporator assembly from the car.

Component Replacement (Fig. 24)

Evaporator Core
Thermostatic Expansion Valve
Thermostatic Switch

1. Remove the evaporator cover to case attaching screws and remove the cover.

2. Remove the plug attaching the thermostatic switch capillary tubing to the evaporator core.
3. Lift out the core and expansion valve as a unit.

NOTE: Replacement of the core, expansion valve or thermostatic switch may be performed at this time.

4. Remove the expansion valve from the core and install new component on the component being retained.
5. Reinstall the core and expansion valve assembly into the evaporator case, replace the thermostatic switch capillary tubing and replace the evaporator case cover.

Installation in Vehicle

1. Place the evaporator assembly in the car and install the refrigerant line connection behind the unit.
2. Carefully lift the assembly into place, engaging the rear stud into the proper hole in the dash panel, and then install the nuts, bolts, washers and lock washers attaching the evaporator case brackets to the instrument panel flange.
3. In the luggage compartment, attach the refrigerant line connection and the evaporator assembly to dash panel attaching stud nut and screw.
4. Replace thermostatic switch bowden cable, drain tube and air duct hoses.
5. Replace the glove box compartment and door, and the spare tire.
6. Charge the system and check for proper operation.

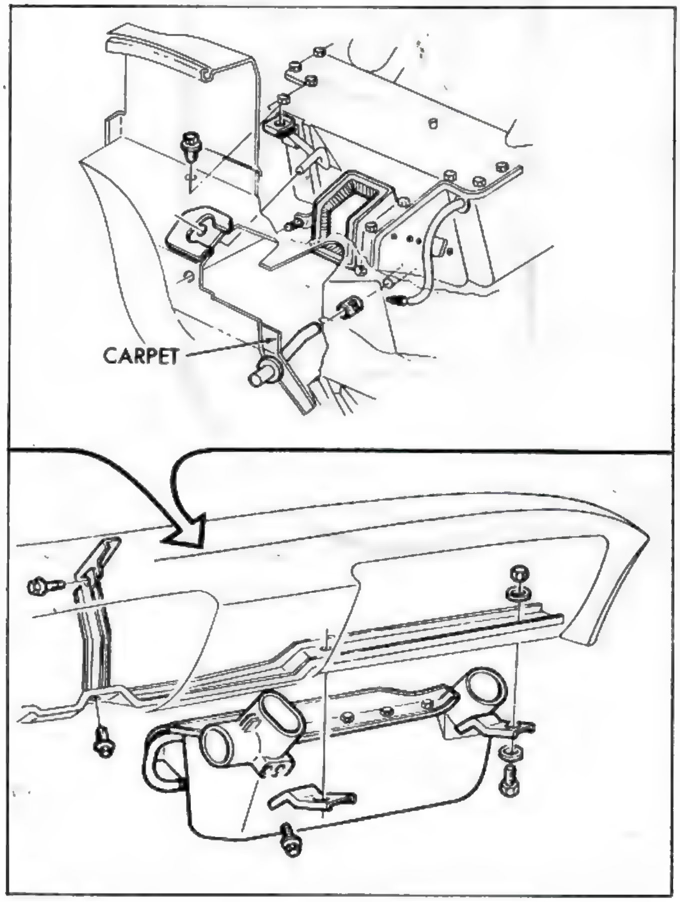


Fig. 23—Evaporator Removal

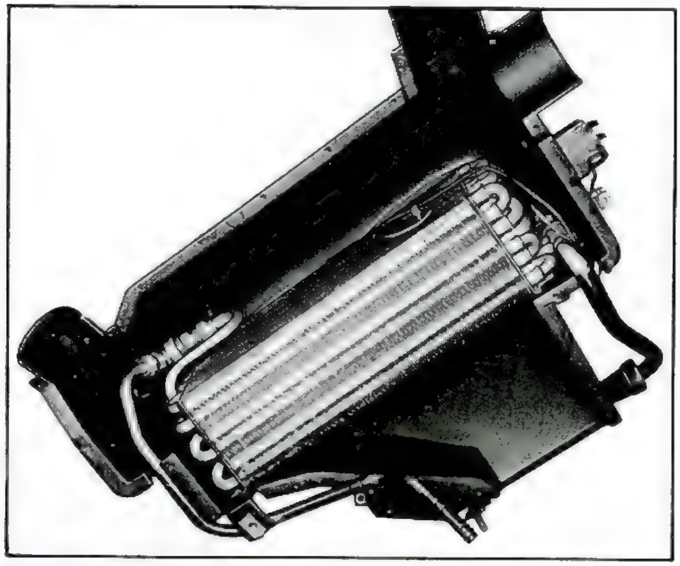


Fig. 24—Evaporator Cover Removed

EXPANSION VALVE

The thermostatic expansion valve is factory adjusted and pre-set and cannot be adjusted after installation. A malfunctioning valve must be replaced. However, before proceeding, check all other possible causes of the trouble. Make certain that the power element bulb is properly positioned on the low pressure line, tightly clamped and has the insulation in place. Make certain the liquid inlet screen between valve and receiver-dehydrator line is not clogged. After checking the screen and the location and mounting of the thermobulb, proceed with replacement of the vavle assembly. A malfunctioning valve may result from a stuck open or shut needle caused by corrosion, or a discharged power element caused by a broken capillary line or tip.

Replacement

1. Remove the evaporator case from the vehicle and the core from the case as previously described.
2. See Figure 24. Disconnect the pipe fittings from the expansion valve and remove the valve and capillary tubing.
3. Install the new expansion valve and capillary tubing.

NOTE: Locate expansion valve bulb in same location as found on original unit. Bulb must contact pipe along its entire length. The insulation must be replaced with no air leaks.

4. Insert assembly in the evaporator case and install in vehicle.

AIR DUCTS AND OUTLETS

Installation of the side ball outlets and the center drum outlet as well as the hose ducts is shown in Figure 25.

BLOWER AND AIR INLET ASSEMBLY

Removal (See Fig. 26)

1. Remove the spare tire from the luggage compartment.
2. Remove the electrical and bowden cable connections from the Blower and Air Inlet Assembly.

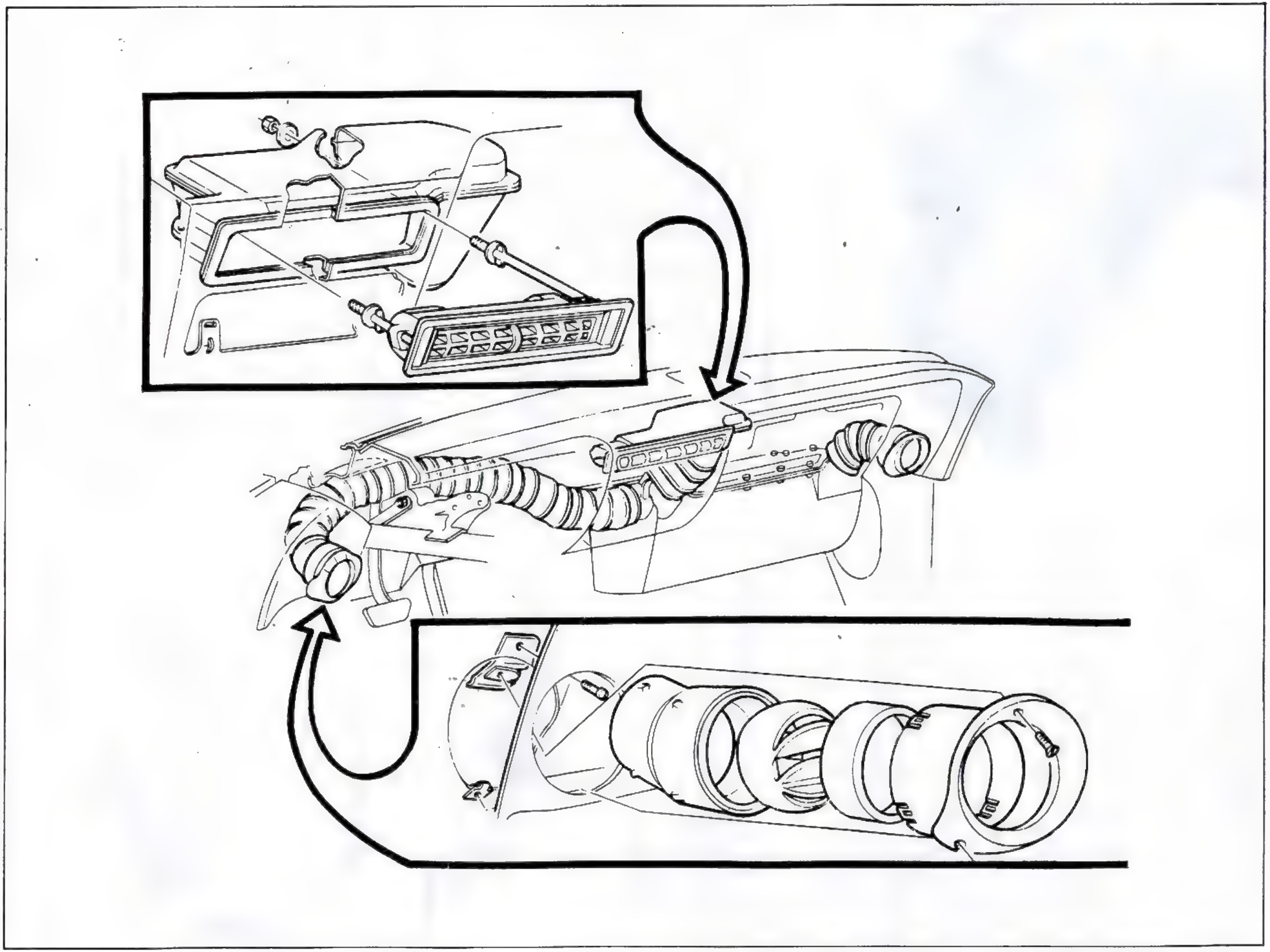


Fig. 25—Air Ducts and Outlets

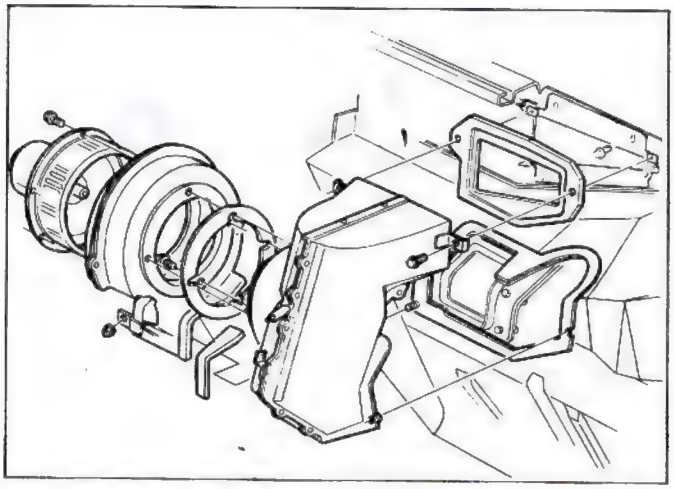


Fig. 26—Blower and Air Inlet Assembly

3. Remove the three inlet assembly to dash panel attaching screws and the single inlet assembly to evaporator stud nut.
4. Remove the stud nut attaching the blower housing to the dash panel.
5. Remove the entire assembly from the dash panel.

Blower Motor Replacement

1. Remove the blower mounting plate to housing attaching screws and pull the motor and drum from housing.
2. Remove the blower drum and mounting plate from the motor and replace on a new motor.
3. Replace the motor, drum and mounting plate assembly on the housing and install the attaching screws.

Installation

1. Set the assembly in place and replace all mounting screws and stud nuts.
2. Install the electrical connector and bowden cable.
3. Replace the spare tire.

CONTROL PANEL ASSEMBLY

Control assembly installation in the control panel as well as installation of the heater-air conditioning blower switch and the air selector switch is illustrated in Figure 27.

Control Panel

The control panel is attached as shown. Remove the attaching screws and drop the control down until the electrical connectors and bowden cables can be removed as necessary.

The right hand control cable runs to the thermostatic switch; the second cable runs through the dash panel to operate the deflector door on the air inlet assembly. The two left control cables are the direct air heater "heat" and "defrost" cables which are routed as for the standard heater.

Fan and Selector Switch

The fan switch operates either the heater blower located on the heater air inlet assembly as described in the Direct Air Heater information previously covered in this section, or the air conditioning blower located on the air conditioning air inlet assembly in the luggage compartment. Switch control passes from one blower to the other according to the position of the COOL control lever. With the COOL control lever in the fully "up" position the fan switch will control the heater blower.

When the COOL control is pushed "down", calling for cooling, a selector switch completes the electrical circuit to the air conditioning blower. Movement of the FAN lever to any of the "on" positions will now complete the electrical circuit to engage the compressor clutch, thus starting the compressor and placing the air conditioning system in operation. The thermostatic switch will now control the compressor as required to provide the degree of cooling desired.

RESISTOR, CONTROL CABLES AND WIRING

Figure 28 illustrates the resistor location, control cable routing and evaporator blower wiring.

COMPRESSOR

The compressor is so constructed that the entire internal mechanism may be serviced as a unit or, if so desired, may be completely disassembled for replacement of components. These service operations, with the aid of trained personnel and the proper service tools, may be simply and easily performed, eliminating the costly necessity of replacing the entire compressor.

Removal (Fig. 29)

NOTE: If the compressor is being removed to gain access to engine components or to service only the compressor clutch coil or pulley assembly, it will not be necessary to purge the system. In that case, disregard Steps 1 and 2 below.

1. Purge the refrigerant from the system.
2. Remove the bolt attaching the compressor connector to the compressor and remove the connector. Cap the openings and swing the connector out of the way.
3. Remove the compressor drive belt.
4. Remove the two bolts "A" attaching the mounting

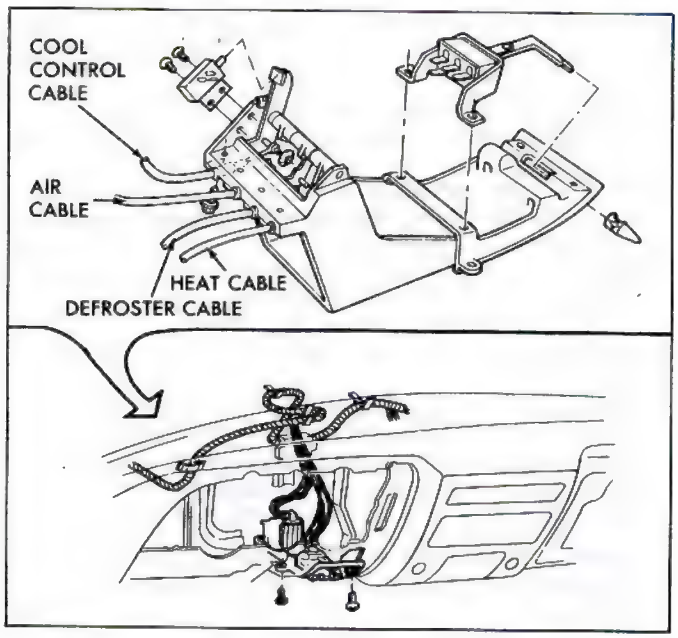


Fig. 27—Control Panel Assembly

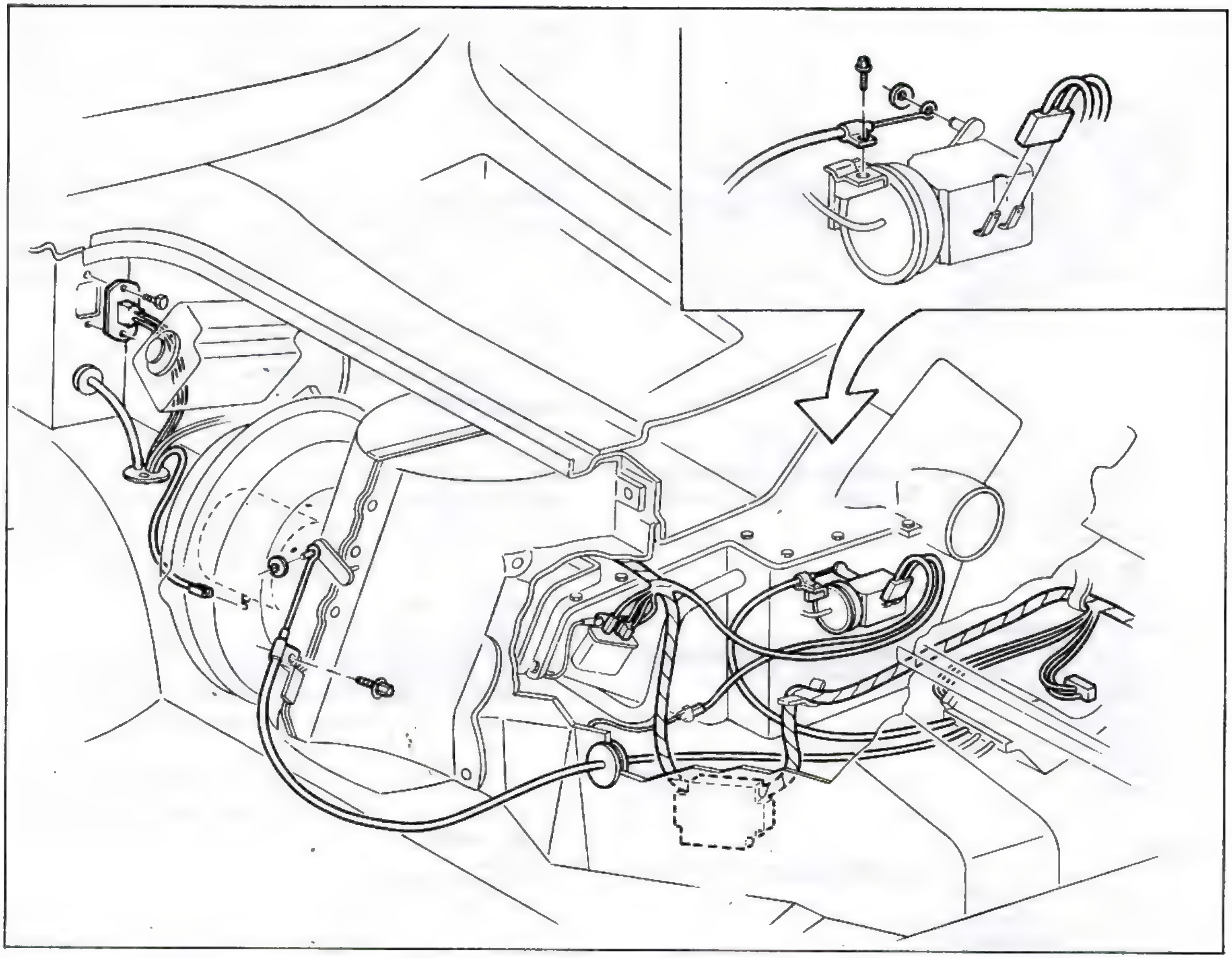


Fig. 28—Cables, Wiring and Resistor Location

bracket to the connector end of the compressor.

5. Disconnect the compressor electrical feed and ground wires.
6. Remove the through bolt attaching nut and washer "B" and the pulley end bracket to support assembly bolt, nut and washers.
7. Slide the compressor toward the rear of the car to disengage it from the through bolt and lift the compressor from the car.
8. Remove the bracket from the compressor, if necessary.
9. Since the service compressor, if used, will be received less the clutch actuating coil parts and clutch pulley assembly, these components, if in satisfactory condition, should be removed from the malfunctioning compressor and installed on the new compressor.

NOTE: Drain and measure oil in the compressor when it is removed. See "Checking and Adding Oil."

Installation

1. Replace the bracket on the compressor if removed.
2. Slide the compressor rearward over the through bolt and install the nut and flat washer.

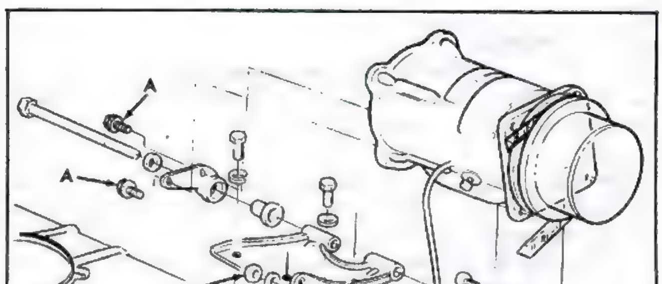


Fig. 29—Compressor Mounting

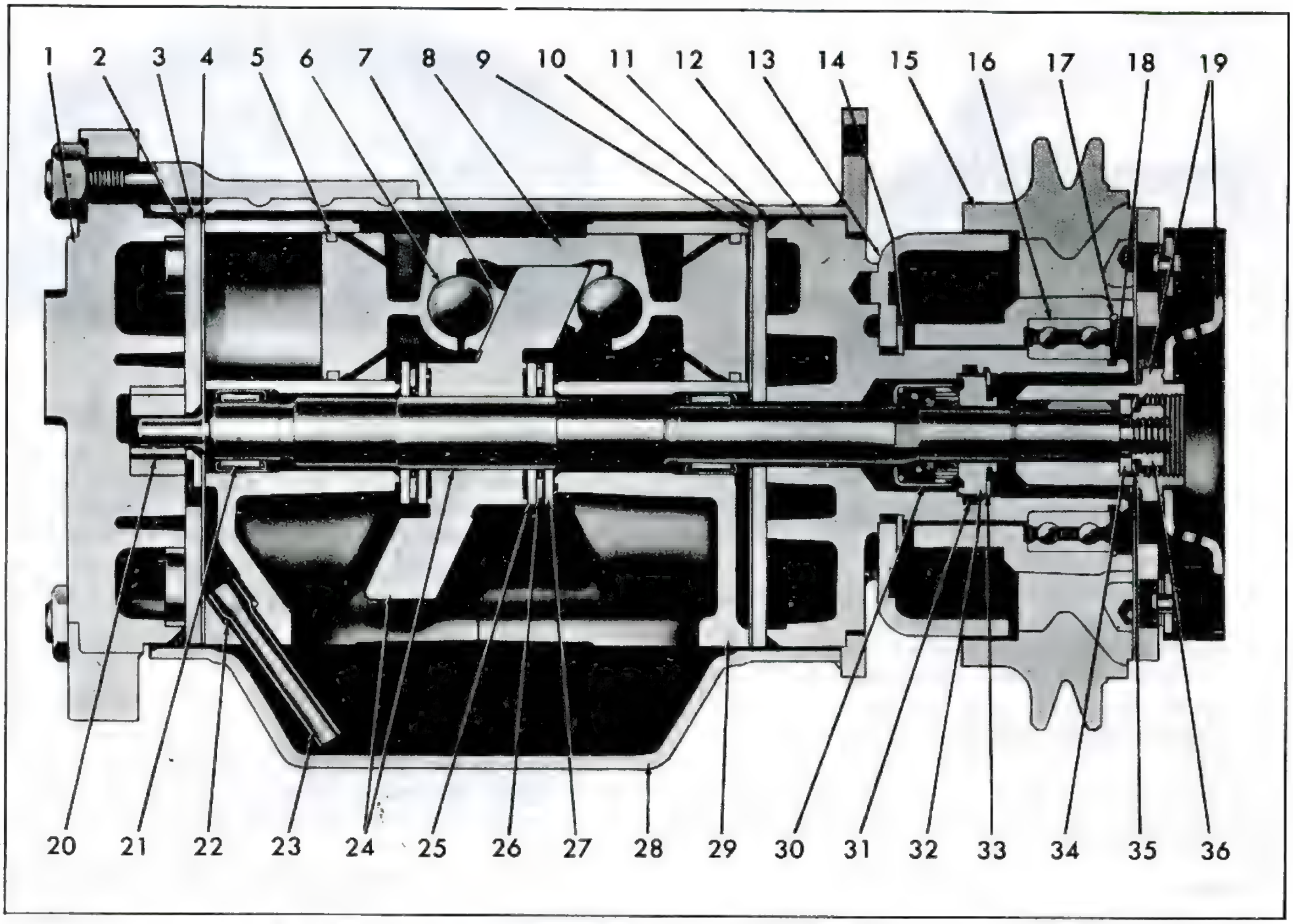


Fig. 30—Six-Cylinder Compressor—Cross Section View

1. Rear Head
2. Rear Head to Shell "O" Ring
3. Rear Discharge Valve Plate
4. Rear Suction Reed Plate
5. Piston Ring
6. Piston Drive Ball
7. Ball Seat
8. Piston
9. Front Suction Reed Plate
10. Front Discharge Valve Plate
11. Front Head to Shell "O" Ring
12. Front Head
13. Coil and Housing Assembly
14. Coil Housing Retainer Ring
15. Pulley and Bearing Assembly
16. Pulley Bearing
17. Pulley Bearing Retainer Ring
18. Pulley and Bearing Retainer Ring
19. Clutch Hub and Drive Plate Assembly
20. Oil Pump Gears
21. Mainshaft Bearing (Rear)
22. Oil Inlet Tube "O" Ring
23. Oil Inlet Tube
24. Wobble Plate and Mainshaft Assembly
25. Thrust Race
26. Thrust Bearing
27. Thrust Race
28. Compressor Shell
29. Cylinder Assembly
30. Shaft Seal
31. Shaft Seal Seat "O" Ring
32. Shaft Seal Seat
33. Shaft Seal Seat Retainer Ring
34. Spacer
35. Clutch Hub Retainer Ring
36. Shaft Nut

3. Replace the bracket-to-support adjusting bolt, washers and nut.
4. Replace the bolts attaching the opposite mounting bracket to the connector end of the compressor.
5. If removed, replace the connector assembly.
6. Replace electrical feed and ground wires.
7. Recharge the system if necessary.

MINOR REPAIR PROCEDURES

The following operations to the Hub and Drive Plate, Pulley and Bearing, and Coil Housing are covered as "Minor" because they may be performed without first purging the system or removing the compressor from the vehicle. The Shaft seal assembly may also be serviced without removing the compressor from the vehicle but this operation is covered later in this section as a "Major Repair Procedure" because the system must first be purged of refrigerant.

Illustrations used in describing these operations show the compressor removed from the vehicle to more clearly illustrate the various operations.

Hub and Drive Plate

Removal

1. If disassembly is being performed on a bench, mount Support Bracket J-9396 in a vise and attach the compressor to the bracket.
2. Using Drive Plate Holding Tool J-9403 and Socket J-9399, remove the locknut from the shaft (fig. 31). Discard locknut.

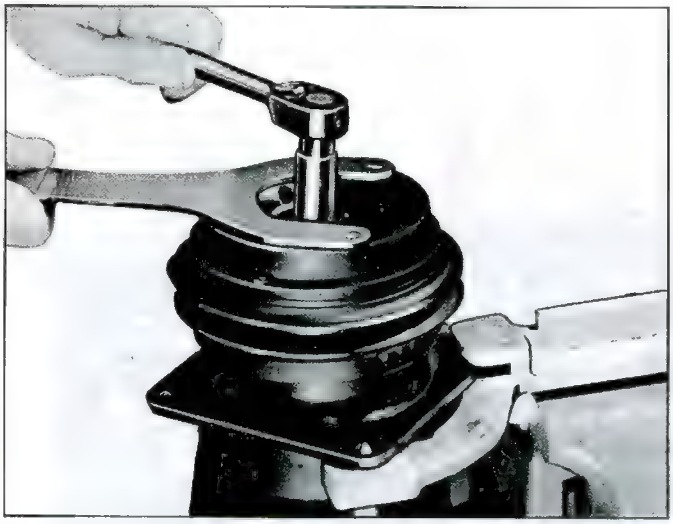


Fig. 31—Removing Shaft Locknut

3. Tool J-9401 may now be used to remove the hub and drive plate assembly (fig. 32).
4. Use Snap Ring Pliers J-5403 to remove the retainer ring (Item 35, fig. 30). Then remove the hub spacer.

   NOTE: Carefully snug tool into place with wrench to insure engagement with threads.

Inspection

If the frictional surface shows signs of damage due to excessive heat, the hub and drive plate and the pulley should be replaced.

Installation

NOTE: When hub and drive plate assembly is ready for installation, clean its frictional face with a suitable cleaner.

1. Insert the square hub and drive plate key into the keyway in the drive shaft allowing it to project approximately 3/16" out of the end of the keyway (fig. 33).

Fig. 32—Removing Hub and Drive Plate Assembly

Fig. 33—Drive Plate Key Installed in Keyway

2. Line up the key in the shaft with the keyway in the hub.
3. Using Tool J-9480 and Washer J-9480-2 (fig. 34), install the hub and drive plate assembly. Pull the assembly onto the shaft until there is approximately 3/32" space between the frictional surfaces of the drive plate and pulley. (A ZERO thrust race is approximately 3/32" in thickness and may be used to roughly gauge this operation.)

   NOTE: Use Tool J-9403 to hold hub and drive plate if necessary.
4. Install the hub spacer washer and, using Snap Ring Pliers J-5403, install the retainer ring (Item 35. fig. 30), convex side of ring facing washer.
5. Use J-9399 and J-9403 to install a new locknut. Tighten the nut to 14-16 ft. lbs. torque. Air gap between the frictional faces should now be .022" to .057".

   NOTE: The shoulder on the locknut must face towards retainer ring.

Fig. 34—Installing Hub and Drive Plate Assembly

Fig. 35—Removing Pulley and Bearing Assembly Retainer Ring

6. The pulley should now rotate freely.

   CAUTION: Never pound or drive the hub and drive plate into position. Always use the proper tools when removing or replacing clutch parts. Failure to do so may result in serious internal compressor damage.

7. Operate the refrigeration system and rapidly cycle the clutch (by turning the air conditioning off and on at least 20 times at approximately one second intervals) to seat the mating parts of the clutch.

Pulley and Bearing Assembly

Removal

1. Remove the hub and drive plate assembly.
2. Using Snap Ring Pliers J-6435, remove the pulley and bearing retainer ring (fig. 35).
3. Remove shaft key.
4. Place Puller Pilot J-9395 over the compressor shaft and pull off the pulley assembly using J-8433 pulley puller (fig. 36).

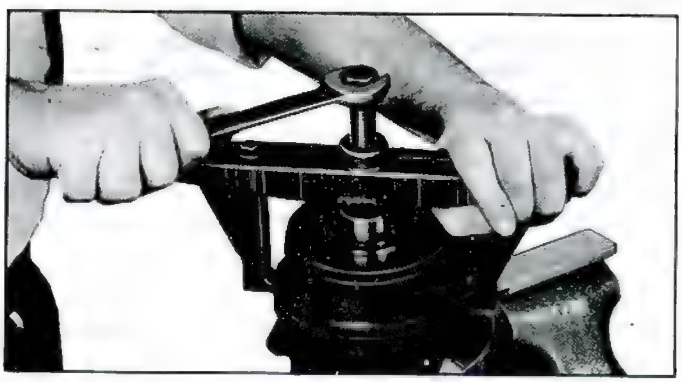


Fig. 36—Removing Pulley

Inspection

Check the appearance of the pulley and hearing assembly. If the frictional surface of the pulley shows signs of excessive grooving due to slippage both the pulley and the clutch hub and drive plate assembly should be replaced. The frictional surfaces of the bearing to be used should be cleaned with a suitable solvent before installation.

Bearing Replacement

1. With the pulley and bearing assembly removed from the compressor, use a sharp pointed instrument to remove the wire retainer ring. From the rear of the pulley, press or drive bearing out of pulley using Tool J-9398 and Handle J-8092.

   CAUTION: If the bearing is to be reused be careful not to slip and damage the seal.

3. From the front of the pulley and using Tool J-9481 with Handle J-8092, press or drive the new bearing into the pulley.

Installation

1. Using Tool J-9481, press or drive the pulley and bearing assembly onto the compressor neck. The pulley should now rotate freely.
2. Install retainer ring using Snap Ring Pliers J-6435.
3. Replace the hub and drive plate assembly. Use proper tools. DO NOT drive or pound on the hub assembly.
4. Install the wire bearing retainer ring.

Coil Housing Assembly

Removal

1. Remove the hub and drive plate assembly, the pulley and bearing assembly, and electrical connector.

Fig. 37—Removing Coil Housing Retainer Ring

2. Scribe the location of the coil housing to the compressor body. This operation is to insure that the electrical terminals will be reassembled in the same position.
3. Using Snap Ring Pliers J-6435, remove the coil housing retainer ring (fig. 37).
4. Remove the coil housing assembly.

Inspection

Check coil for loose connectors or cracked insulation. Amperage should not be more than 3.2 amps at 12 volts D.C. at room temperature.

Installation

1. Rotate the coil housing to the correct position as indicated by the scribe marks and the location of the electrical terminals and fit into place (fig. 38).
2. Use Snap Ring Pliers J-6435 to install retainer ring.

   NOTE: Install flat surface of the retainer ring facing the coil housing.

3. Replace the pulley and bearing assembly and the hub and drive plate assembly. DO NOT drive or pound on the hub assembly.
4. If the compressor is installed in the vehicle, connect the electrical connections.

MAJOR REPAIR PROCEDURES

The following service procedures are considered major since the refrigeration system must be completely purged of refrigerant before proceeding and/or because major internal operating and sealing components of the compressor are being disassembled and serviced. A clean workbench, preferably covered with a sheet of clean paper, orderliness in the work area and a place for all parts being removed and replaced is of great importance as is the use of the proper service tools. Any attempt to use make-shift or inadequate equipment may result in damage and/or improper compressor operation.

These procedures are based on the use of the proper service tools and the condition that an adequate stock of service parts is available. This service parts stock should include the following:

1. Major interior mechanism assembly - ready for installation in shell as is.
2. Service cylinder assembly - front and rear halves with main bearings in place and halves dowel pinned together.
3. Standard size piston drive balls.
4. Ball seats - total of 10 sizes, including the ZERO seat.
5. Thrust races - total of 14 sizes, including the ZERO race.
6. Pistons.
7. Main shaft bearings.
8. Thrust bearings.
9. Compressor shaft, wobble plate and Woodruff key assembly.
10. Suction reed valves.
11. Discharge valve plate - front and rear.
12. Seal kit - service - contains all seals and "O" rings. To be used each time a compressor is rebuilt.
13. Shaft seal kit.
14. Nuts - head to shell, and shaft.
15. Retainer rings - all necessary sizes.
16. Cylinder locator (dowel) pins.

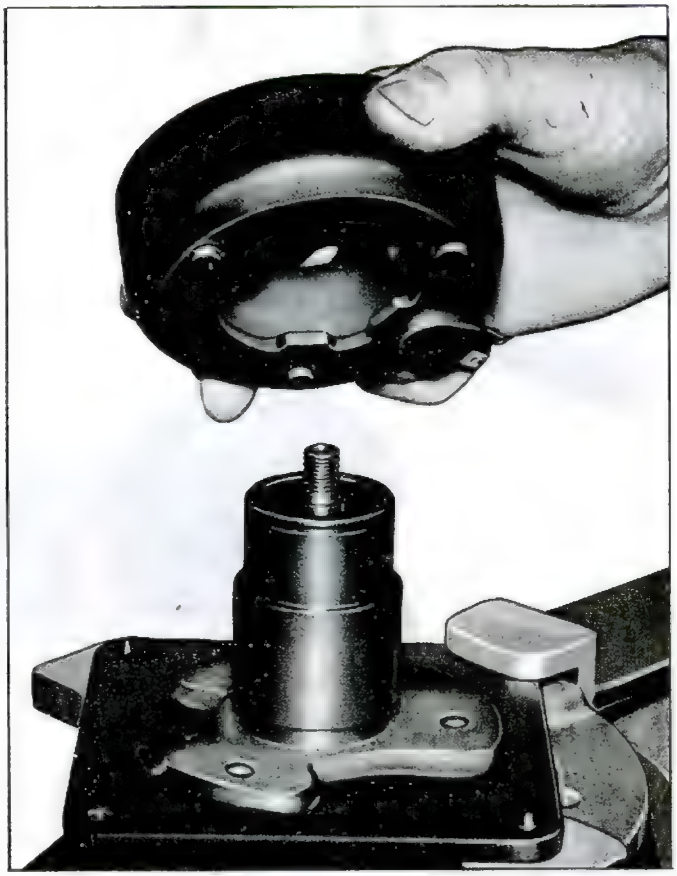


Fig. 38—Installing Coil Housing

17. Valve and head locator (dowel) pins.
18. Service discharge crossover tube kit.

All parts required for servicing are protected by preservation process and packaged in a manner which will eliminate the necessity of cleaning, washing or flushing of the parts. The parts can be used in the mechanism assembly just as they are removed from the service package.

Piston ball seats and shaft thrust races will be identified on the parts themselves to denote their size and dimension.

Shaft Seal Assembly

When replacing the shaft seal assembly, even if the compressor remains on the vehicle during the operation, it will be necessary to purge the system of refrigerant as outlined previously in this section.

Removal

1. After first purging the system of refrigerant, remove the clutch hub and drive plate, and the shaft key.
2. Remove the seal seat retaining ring using Snap Ring Pliers J-5403 (fig. 40).
3. Using Tool J-9393 (1 and 2), grasp the flange on the seal seat and lift out the seal seat (fig. 41).
4. Remove the seal seat "O" ring from the housing bore using Tool J-9553 (fig. 41).
5. Engage the tabs on the seal assembly with the locking

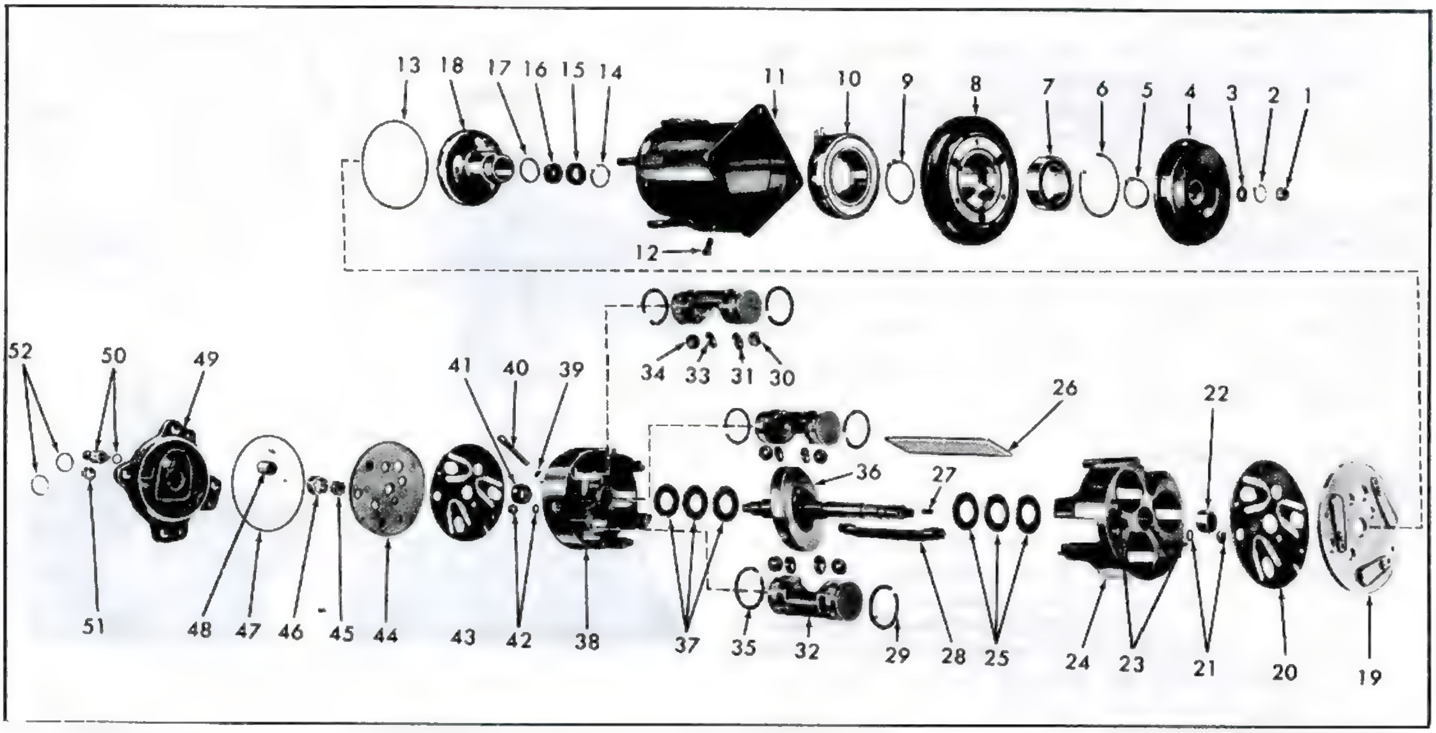


Fig. 39—Six-Cylinder Compressor—Exploded View

1. Shaft Nut
2. Clutch Hub Retainer Ring
3. Spacer
4. Clutch Hub and Drive Plate Assembly
5. Pulley and Bearing Retainer Ring
6. Pulley Bearing Retainer Ring
7. Pulley Bearing
8. Pulley
9. Coil Housing Retainer Ring
10. Coil Housing
11. Compressor Shell
12. Oil Drain Plug
13. Front Head-to-Shell "O" Ring
14. Shaft Seal Seat Retainer Ring
15. Shaft Seal Seat
16. Shaft Seal
17. Shaft Seal Seat "O" Ring
18. Compressor Front Head
19. Front Discharge Valve Plate
20. Front Suction Reed Valve
21. Discharge Crossover Tube Front "O" Ring and Spacer
22. Mainshaft Front Bearing
23. Head Locating Pins
24. Front Cylinder Half
25. Front Thrust Race and Bearing Pack
26. Suction Crossover Cover
27. Drive Key
28. Discharge Crossover Tube
29. Piston Ring
30. Piston Front Drive Ball
31. Piston Front Ball Seat
32. Piston
33. Piston Rear Ball Seat
34. Piston Rear Drive Ball
35. Piston Ring
36. Drive Shaft and Wobble Plate Assembly
37. Rear Thrust Race and Bearing Pack
38. Rear Cylinder Half
39. Oil Inlet Tube "O" Ring
40. Oil Inlet Tube
41. Mainshaft Rear Bearing
42. Discharge Crossover Tube Rear "O" Ring and Spacer
43. Rear Suction Reed Plate
44. Rear Discharge Valve Plate
45. Oil Pump Drive Gear
46. Oil Pump Driven Gear
47. Rear Head-to-Shell "O" Ring
48. Strainer Screen
49. Compressor Rear Head
50. High Pressure Relief Valve and "O" Ring
51. Rear Head-to-Shell Retaining Nuts
52. Compressor-to-Connector "O" Rings

tangs on Tool J-9392 by pressing down and twisting the tool, then lift the seal out.

Inspection

Check the face of the seal for nicks, gouges or serrations. If damage of any kind is evident, replace the seal. Be extremely careful that the face of the seal which is to be installed is not scratched or damaged in any way.

Installation

1. Engage seal onto the locking tangs of Tool J-9392 (fig. 42) and, with J-21303 installed over the end of the shaft, carefully insert the seal and tool over the end of the shaft. Turn seal to engage the flat on the shaft, then remove the tool.
2. Coat a new "O" ring and the interior of the seal cavity, shaft and seal with clean refrigeration oil and, using Tool J-21508, install the "O" ring in its groove just above the seal.

   To install the "O" ring place "O" ring on tool as shown in Figure 42, insert the tool fully into the front head bore, press down the slider, twist entire tool to seat "O" ring and then remove tool.
3. Using Tool J-9393 grasp the seal seat and set in place on top of the seal.
4. Using Snap Ring Pliers J-5403, replace the retaining ring. Tap with the palm of the hand on the barrel of J-9393 to press the retainer ring into place.

NOTE: Install the retaining ring with the flat surface facing the seal seat.

5. Leak test the compressor as described under "Leak Testing the Compressor" in this section.
6. Reinstall the clutch hub and drive plate.
7. Replace the compressor on the vehicle if it was previously removed, and evacuate and charge the system.

Pressure Relief Valve

When a faulty pressure relief valve, located in the rear head casting, is encountered, the valve assembly should be removed after purging the system and a new valve and gasket installed. The entire system should then be evacuated and recharged.

Compressor Rear Head and Internal Mechanism

Service operations to the rear head or internal mechanism of the compressor should be performed with the compressor removed from the vehicle to insure that the necessary degree of cleanliness may be maintained. Clean hands and a clean bench, preferably covered with clean paper, are of extreme importance.

Rear Head, Oil Pump and Valve Assemblies

Removal

1. Remove the compressor from the vehicle, drain compressor oil into a clean container, clean the exterior of the compressor case and rear head casting with a suitable solvent and mount the compressor, rear head up, in holding Fixture J-9396 which should then be mounted securely in a vise.
2. Remove the four nuts from the shell studs.
3. Remove the rear head. Examine the teflon surface on the casting webs. If this surface is damaged by nicks or scratches, the head should be replaced.
4. Examine the suction screen in the rear head for any damage or contamination. Clean or replace the screen as necessary.
5. Remove and examine the oil pump gears. If either of the gears shows any wear or damage, replace both gears.

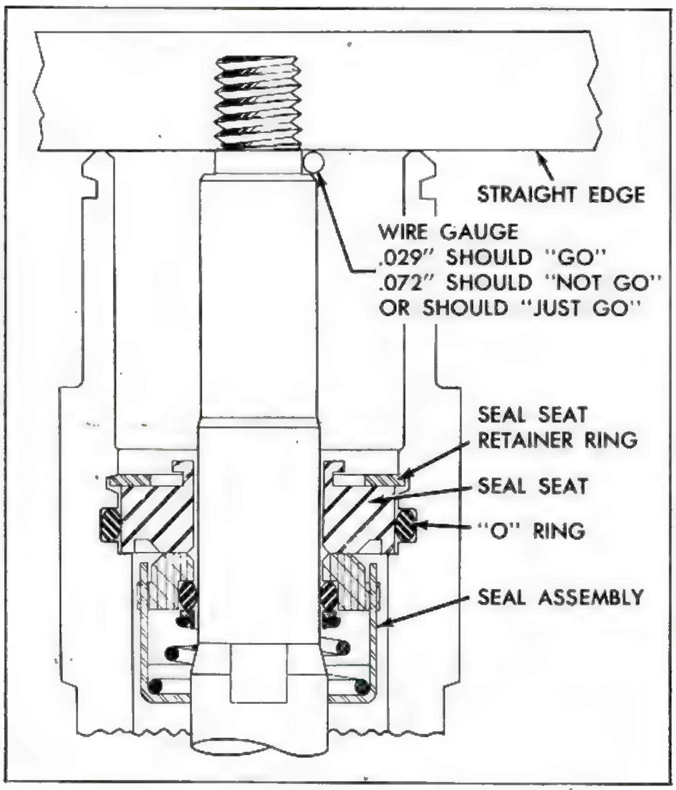


Fig. 40—Checking for Wobble Plate Position on Shaft

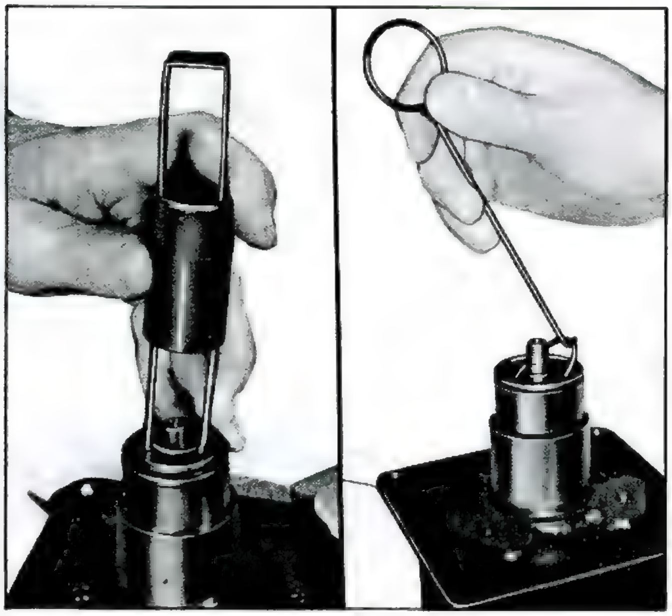


Fig. 41—Removing Seal Seat and "O" Ring

NOTE: Keep the ends of the two oil pump gears matched and replace the same end toward the discharge plate upon reassembly.

6. Remove the rear head-to-shell "O" ring and discard. With two screw drivers, carefully pry up on the rear discharge valve plate assembly (fig. 43). Check for broken reeds or damaged seats and replace entire assembly if such is found.

CAUTION: Excessive force during this operation may loosen valve reed retainer rivets.

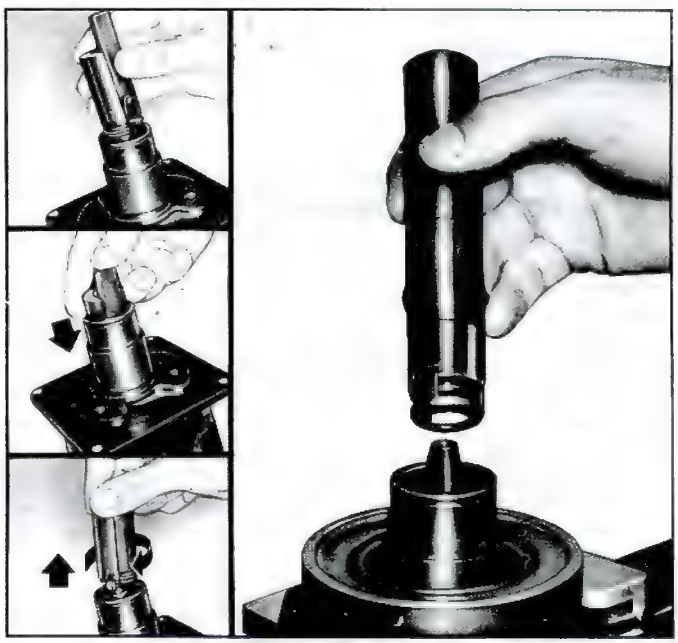


Fig. 42—Replacing Seal and "O" Ring

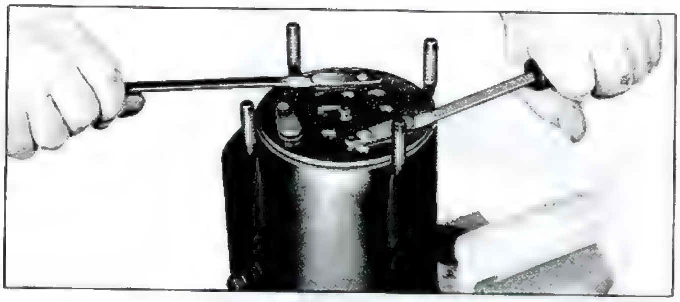


Fig. 43—Removing Rear Discharge Valve Plate

8. Carefully lift off the rear suction reed valve. Valve must be replaced if any damage is evident.

Installation

1. Carefully replace the suction reed valve plate and the rear discharge plate over the dowel pins and ports in the cylinder assembly. Proper positioning of the reed plate may be determined by lining up the proper opening in the plate with the discharge crossover tube opening.
2. Position the rear head casting to align with the dowel pins. The two lower mounting pads will be in alignment with the oil sump in the shell. Rotate the cylinder assembly back and forth by hand, if necessary, to permit this alignment. Remove the rear head from this trial assembly.
3. Install the inner oil pump gear over the "D" flat on the shaft and place the outer oil pump gear over the inner gear. Position the outer gear as follows:

Fig. 44—Proper Oil Pump Gear Positioning

   a. Observe the position of the oil sump in the shell.
   b. Locate the approximate centerline of this sump.
   c. Facing the centerline of the sump and viewing from the sump side (bottom) of the compressor, move the OUTER gear toward the left (side having the oil test fitting) until it is at approximately 90° (9 o'clock position) from the centerline of the oil sump (fig. 44).
4. Coat the head-to-shell "O" ring with clean refrigeration oil and generously lubricate the area around the outer edge of the valve plate where the "O" ring will be placed. Oil also the oil pump gears, valve reeds and the area where the teflon gasket will contact the valve plate.
5. Install the head-to-shell "O" ring.
6. Be sure that the suction screen is properly positioned in the rear head, then assemble the rear head to the compressor shell being careful not to damage the teflon gasket.

NOTE: As an aid to replacing the head in the proper position, be sure the inlet and outlet parts are toward the top of the compressor.

CAUTION: Be sure head does not bind against oil pump gears when being installed.

7. Install new nuts to the threaded shell studs and tighten to 19-23 ft. lbs. torque.
8. Leak test the compressor as outlined under "Leak Testing the Compressor" in this section.
9. Install compressor as described under "Compressor - Installation."

Major Internal Mechanism

The clutch hub and drive plate assembly, drive key, pulley and coil housing should be removed before proceeding with the following compressor disassembly.

Removal from Shell

1. Remove the rear head, discharge plate and suction reed valve from the compressor as outlined under "Rear Head and Reed Valve Assemblies" above.

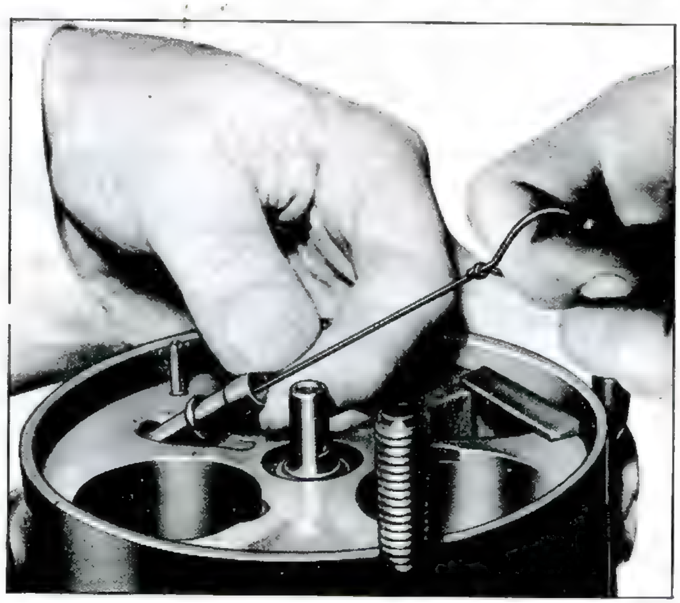


Fig. 45—Removing Oil Inlet Tube and "O" Ring

2. Remove the oil inlet tube and "O" ring with J-5139 as shown in Figure 45.
3. Carefully lay the compressor shell on its side and slide out interior mechanism and front head assembly. Do not hammer or use undue force to remove the mechanism; however, gentle taps on the head casting may aid in removing the assembly.
4. Remove front head casting, front discharge valve plate and suction reed valve from the mechanism. Examine parts for damage and replace if necessary. Check particularly for damage to the teflon surfaces on the front head casting webs.
5. Examine the mechanism for any obvious damage.
6. Remove the suction crossover cover (fig. 46).
7. If desired, the mechanism may be assembled in checking Cage J-9397 and operated on a motor test stand, or by some other suitable means, to observe sound level and general operation. Tighten cage nuts evenly to 15 ft. lbs. torque.
8. While in the checking cage, make a check of the clearances between each rear piston ball seat and the wobble plate (reading must be between .0005-.0010). Check also the clearance between the rear thrust race and rear thrust bearing. (Maximum clearance should be .0015). These checks may give some indication of the cause of the trouble.
9. Remove mechanism from the cage.

Disassembly

If the mechanism has sustained major damage, due possibly to loss of refrigerant and/or oil, it may be necessary to replace it with a complete service interior mechanism assembly rather than to replace individual parts. If further disassembly is considered worthwhile, proceed as follows:

1. Before disassembling the cylinder and mechanism, number the pistons and cylinder locations so that all parts may be replaced in their original location. Pistons and cylinder bores may be identified by numbering them 1, 2 and 3 with a pencil.
2. Use an old discharge tube to drive discharge tube out of cylinder (fig. 47). (Drive from REAR of cylinder.)
3. Drive the cylinder halves apart and free from the dowel pins and discharge crossover tube using a fiber block and mallet (fig. 48). Discard the discharge crossover tube.

Fig. 47—Unseating Discharge Crossover Tube

NOTE: Before driving cylinder apart, position wobble plate toward front of compressor in area of the crossover tube.

4. Carefully remove the rear half of the cylinder from the pistons and set the front cylinder half, with the piston, shaft and wobble plate, in J-9397.
5. Push up on the shaft and, one assembly at a time, remove pistons, rings, seats and balls placing all parts in Tray J-9402 in the compartment associated with the proper end of the piston. Discard all piston ball seats.

NOTE: The front of the piston may be identified by a notch in the casting web. See Figure

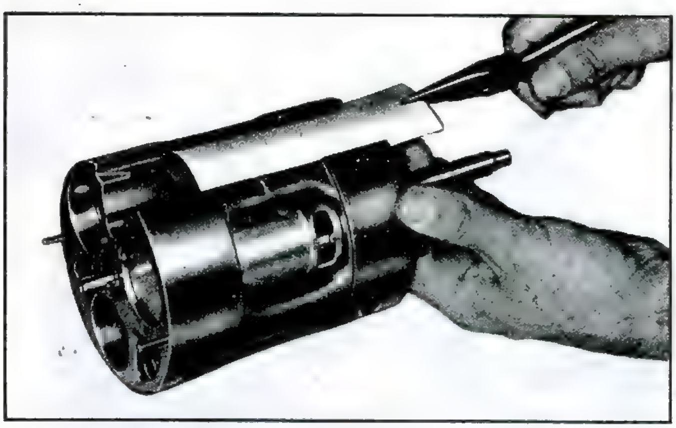


Fig. 46—Removing Suction Crossover Cover

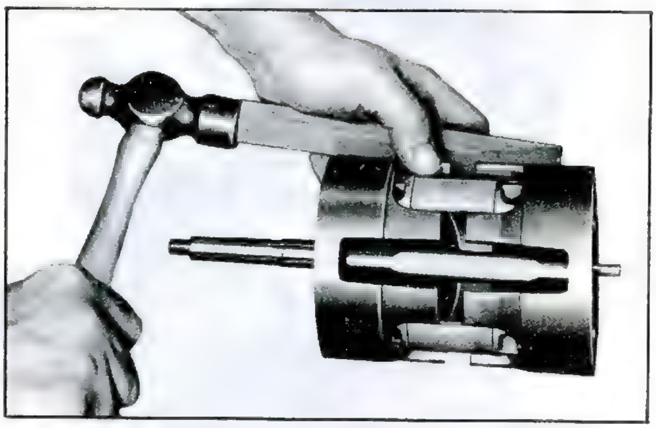


Fig. 48—Separating Cylinder Halves

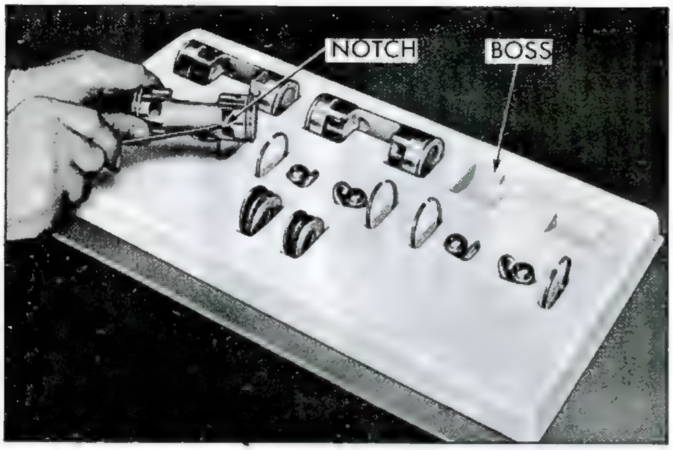


Fig. 49—Notch Identifying Front End of Piston

49. The piston compartments in Tray J-9402 have a boss at this notch location to indicate the front.

6. Remove and inspect all piston rings. Replace all broken or damaged rings. Damaged pistons must also be replaced.
7. Examine piston balls. Replace if they show burning or excessive wear.
8. Remove the rear combination of thrust races and bearing from the shaft and discard all three pieces.
9. Remove the shaft and wobble plate assembly from the front half of the cylinder.
10. Remove the front combination of thrust washers and bearing and discard all three pieces.
11. Examine all surfaces of the wobble plate and, if satisfactory, reuse. If it shows signs of wear, replace the shaft and wobble plate as an assembly. Use care not to move wobble plate on the shaft. This is factory set.
12. Examine the front and rear cylinder halves and replace if cylinder bores are deeply scored or damaged.
13. Wash all parts to be reused in a suitable cleaner. Blow dry all parts.
14. If cylinder main bearings are to be replaced they may be removed and reinstalled at this time using Tool J-9432. Drive against the lettered end of the bearings and from the outside of the cylinder. Bearing must be no more than 1/8" below surface.

Gauging Procedure

The gauging operations which follow have been worked out on a simple basis to establish and provide necessary running clearances. Two gauging procedures are necessary.

The first gauging operation is made to choose the proper size ball seats to provide, at each piston, a .0005" to .0010" total clearance between the seats and the wobble plate at the tightest place through the 360° rotation of the wobble plate. The bronze ball seats are provided in .0005" variations including a basic ZERO seat.

The second gauging operation, performed at the rear shaft thrust bearing and race pack, is designed to obtain .0005" to .0015" preload between the hub surfaces of the wobble plate and the front and rear hubs of the cylinder.

A total of 14 steel thrust races, including a basic ZERO race, are provided in increments of .0005" thickness to provide the required clearance. Proper selection of thrust races and ball seats is of extreme importance. If tolerance is greater than maximum clearance, noisy operation of the compressor will result while tolerance less than minimum clearance could result in galling and seizure of the parts.

1. Secure from service parts stock:
   Four-ZERO thrust races
   Three-ZERO ball seats
   Two-New thrust bearings
2. Assemble a ZERO thrust race, a new needle thrust bearing and another ZERO thrust race, in that order, to the front end of the shaft. (A dab of petroleum jelly will hold the bearing-race pack together and in place on the shaft.) Lubricate front and rear faces of the wobble plate with refrigeration oil.
3. With the front half of the cylinder assembly resting on Tool J-9397, insert the shaft, threaded end through the front main bearing until the thrust race assembly rests on the front cylinder hub.
4. Assemble a ZERO thrust race, a new needle bearing and a second ZERO thrust race in that order, to the rear of the shaft.
5. Apply a light smear of clean petroleum jelly to the ball pockets of each of the three pistons.
6. Place the balls in the piston pockets. The petroleum jelly will hold the balls in place.
7. Apply a light smear of petroleum jelly to the cavity of three new ZERO ball seats and place one seat over each front piston ball. There should now be a ball and seat in the front ball pocket of each piston and a ball only in the rear ball pocket.

NOTE: Do not assemble any of the piston rings at this time.

8. Rotate the shaft and wobble plate until the high point of the wobble plate is directly over the cylinder bore previously designated as No. 1. Lift up slightly on the shaft and wobble plate assembly, insert the

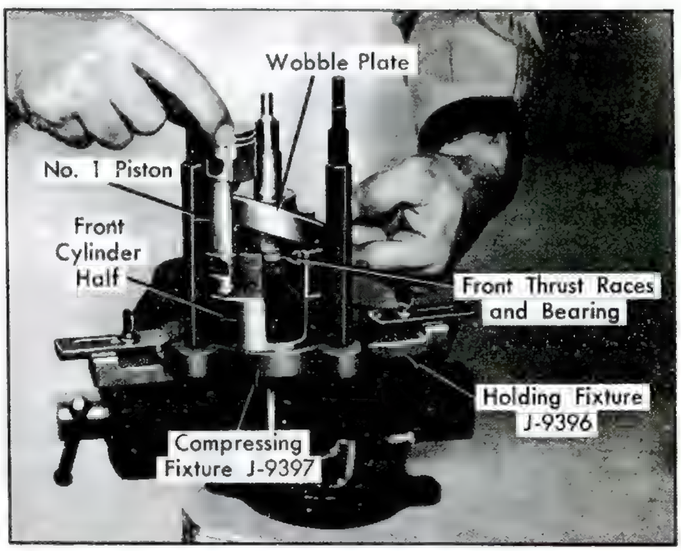


Fig. 50—Installing Piston, Front Ball and Seat and Rear Ball

front (notched) end of the No. 1 piston into the cylinder bore, and at the same time, place the front ball and seat and the rear ball only over the wobble plate (fig. 50). Hold front thrust bearing pack tight against wobble plate hub while lifting shaft.

9. Repeat this operation with pistons No. 2 and No. 3.
10. Align the rear head casting with bores, suction passage, discharge crossover holes, and dowel pins. Tap into place, using a plastic block and mallet (fig. 51).
11. Place the cylinder assembly in the checking cage with the front of the compressor shaft pointing up, positioning the discharge tube opening between the cage bolts. This will provide access for the feeler gauge. Assemble the cage and tighten all nuts evenly to 19-23 ft. lbs. torque.
12. Use a leaf type feeler gauge and a suitable spring scale to check clearance between the REAR ball and the wobble plate (fig. 52) of the No. 1 piston. Use a suitable combination of feeler gauge leafs until 4 to 8 oz. of force is required to pull gauge from between the ball and the plate.

NOTE: Use undamaged feeler gauges generously lubricated with refrigeration oil. Support the spring scale so that only the actual force required to pull the feeler gauge free is measured.

Rotate the shaft approximately 120° and again check with a feeler gauge between the parts. Rotate the shaft another 120° and make a third check. From this total of three feeler gauge checks, use the MINIMUM reading to select a numbered seat to correspond to the feeler gauge reading (i.e. - if minimum reading was .019, use a No. 19 seat. If reading was .0195, use a No. 19-1/2 seat). Place this seat in the parts tray in the compartment corresponding to the rear ball position of the No. 1 piston.

13. Repeat the operation described in Step 12 for pistons No. 2 and No. 3.
14. The next gauging operation is to determine the space between the REAR thrust bearing and the upper (outer) rear thrust race. Use a suitable combination of feeler gauge leafs so that 4 to 8 oz. of force is required to pull gauge free (fig. 53). Select a numbered thrust race to correspond to this feeler gauge reading and place this race in parts tray in the rear thrust race compartment.
15. Loosen the nuts and ring from the checking cage.
16. Drive the cylinder halves apart, using a fiber block and mallet.
17. Carefully remove the rear half of the cylinder and set the front half (including the pistons and shaft and wobble plate assembly) on J-9397.

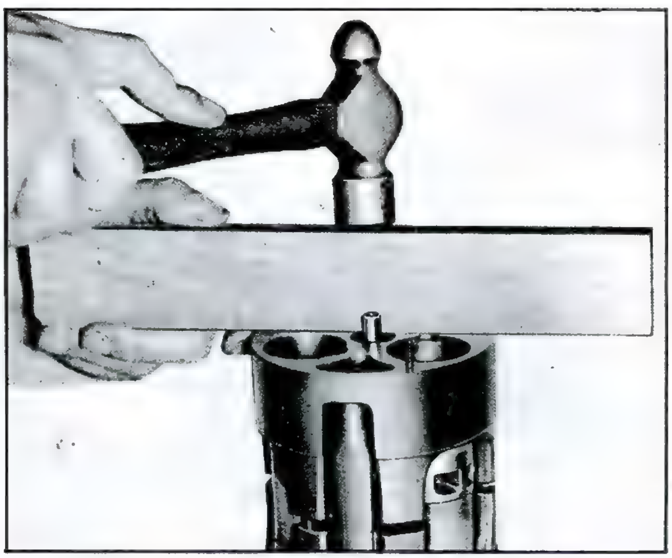


Fig. 51—Assembling Cylinder Halves

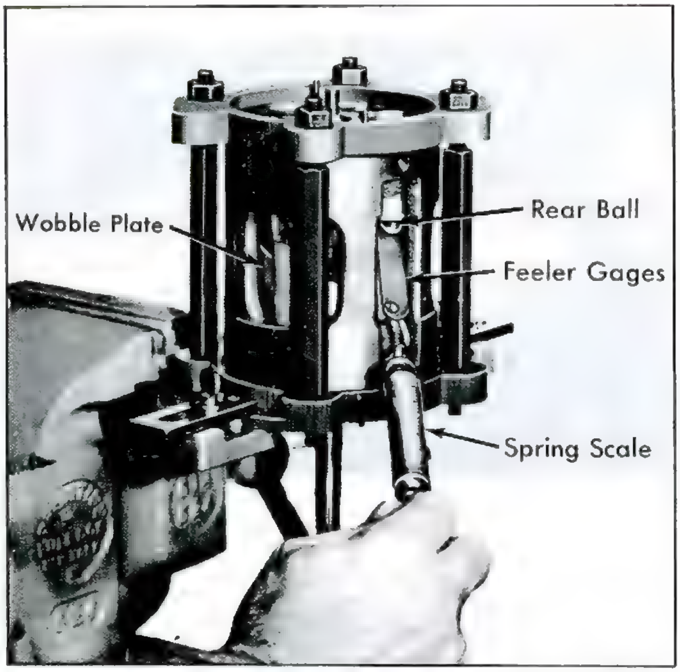


Fig. 52—Checking Clearance Between Rear Ball and Wobble Plate

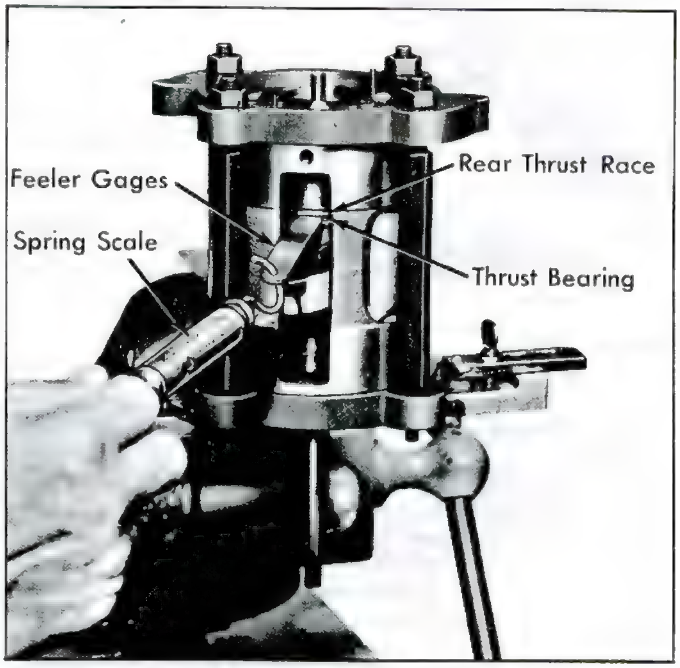


Fig. 53—Checking Clearance Between Rear Thrust Bearing and Outer Thrust Race

18. Carefully remove one piston at a time from the wobble plate and the front half of the cylinder. Transfer each piston, ball and seat to its proper place in the parts tray along with the numbered rear seat chosen in Steps 12 and 13 above.

    CAUTION: When the balls and seat are removed from the piston, be sure that they are placed in the proper parts tray pocket so as not to lose the relationship of the balls and seats to the proper end of the piston.

19. Remove the rear outer (upper) ZERO thrust race from the compressor shaft and replace it with the numbered thrust race (determined in Step 14 above) from the parts tray.

    NOTE: This ZERO thrust race may be put aside for reuse in future gauging and/or rebuild operations.

20. The gauging operations are now complete.

Assembly

After properly performing the gauging procedure and choosing the correct ball seats and thrust races as outlined under "Gauging Procedures," the cylinder assembly may be reassembled. Be sure to install all new seals and "O" rings. All are included in the compressor seal service kit.

Assembly procedure is as follows:

1. Support the front half of the cylinder assembly on Fixture J-9397 and install the shaft and wobble plate, threaded end down, with its front bearing race pack (ZERO race, bearing and ZERO race) and its rear bearing race pack (ZERO race, bearing, numbered race) if this was not already done at the end of the "Gauging Procedure."

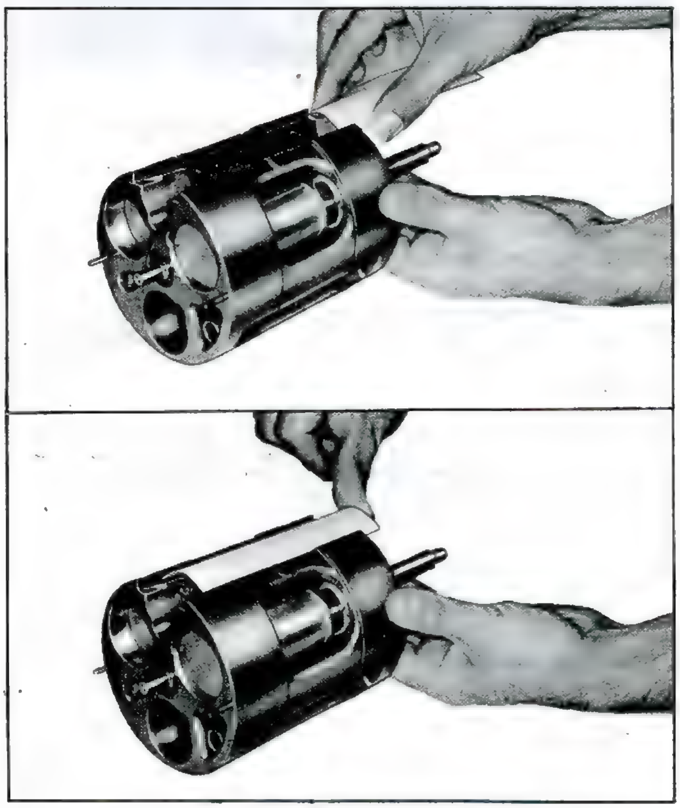


Fig. 54—Installing Suction Crossover Cover

2. Assemble a piston ring, scraper groove toward the center of the piston, to each end of the three pistons.
3. Apply a light smear of petroleum jelly to the numbered ball seats chosen in the gauging procedure and install all balls and seats (if removed in Step 18 of the gauging procedure) in their proper place in the piston.
4. Rotate the wobble plate so that the high point is above cylinder bore No. 1. Carefully assemble piston No. 1, complete with ball and ZERO seat on the front and ball and numbered seat on the rear, over the wobble plate. Hold front thrust pack tight against wobble plate hub while lifting hub. Compress and enter the piston ring into the front cylinder half.
5. Repeat this operation for pistons No. 2 and No. 3.
6. Assemble one end of a service discharge crossover tube into the hole in the front cylinder half.
7. Rotate the shaft to position the pistons in a stair-step arrangement, then carefully place the rear cylinder half over the shaft and start the pistons into the cylinder bores.
8. Compress the piston ring on each piston to permit its entrance into the cylinder.
9. When all three pistons and rings are in their respective cylinders, align the end of the discharge crossover tube with the hole in the rear half of the cylinder.

    NOTE: Be sure the flattened portion of this tube faces the inside of the compressor to allow for wobble plate clearance.

10. When all parts are in proper alignment, tap with a fiber block and mallet to seat the rear half of the cylinder over the locating dowel pins. If necessary, clamp the cylinder in J-9397 to complete drawing the cylinder halves together.
11. Generously lubricate all moving parts with clean refrigeration oil and check for free rotation of the parts.

    NOTE: It may be desirable to clamp the cylinder assembly in compressing Fixture J-9397 and check on the motor test stand for proper operation before proceeding further. If any improper operation is observed the mechanism should be regauged to insure proper operation. Complete the assembly procedure when correct operation is obtained.

12. Replace the suction crossover cover as shown in Figure 54. Compress the cover as shown to start it into the slot and then press it in until flush on both ends.

Installation Into Shell

1. Support the cylinder on Fixture J-9521 with the threaded end of the shaft up.
2. Assemble the two dowel pins in the front cylinder if they are not already in place.

    NOTE: A rod drilled 1/4" deep to the O.D. of the dowel pins will aid in installing.

3. Install the discharge crossover tube front "O" ring and spacer (fig. 55).
4. Aligning the dowel pin holes, discharge crossover

and oil return slot, assemble the suction reed valve to the front end of the cylinder.

5. Assemble the front discharge valve plate, aligning the holes with the dowel pins and proper opening in the head.

   NOTE: The front discharge plate has a larger diameter hole in the center than the rear discharge plate.

6. Check the teflon surface on the compressor front head casting webs and replace the entire casting if there is any evidence of damage. Discard the "O" ring.
7. Coat the valve plate with clean refrigeration oil. Rotate the front head casting until it is properly positioned over the discharge reed retainers and dowel pins, then set it in place (being careful not to damage the teflon surfaces) and seat it over dowels with light mallet taps.

   NOTE: Dowel pin and hole location can be marked with pencil to aid in locating proper position.

8. Apply clean refrigeration oil to a new "O" ring and "O" ring groove at the lower edge of the front head casting and carefully assemble the "O" ring in the groove.
9. Coat the inside machined surfaces of the compressor shell with refrigeration oil.
10. Locate the oil intake tube hole in the rear discharge plate. Line up the oil sump with this hole location and slide the shell down over the mechanism while supporting the mechanism on J-9521 (fig. 56).
11. Place Compressor Support Bracket J-9396 in a vise and, carefully inverting the compressor case with the mechanism inside, mount the front compressor flange on the support bracket.
12. Place a new "O" ring in the oil intake tube hole applying clean refrigeration oil to the oil intake tube hole and the "O" ring. Rotating the compressor mechanism to line up with the hole in the compressor case baffle, install the pickup tube. Be sure that the "O" ring and intake tube are properly seated.

Fig. 55—Installing Discharge Crossover Tube Front "O" Ring and Spacer

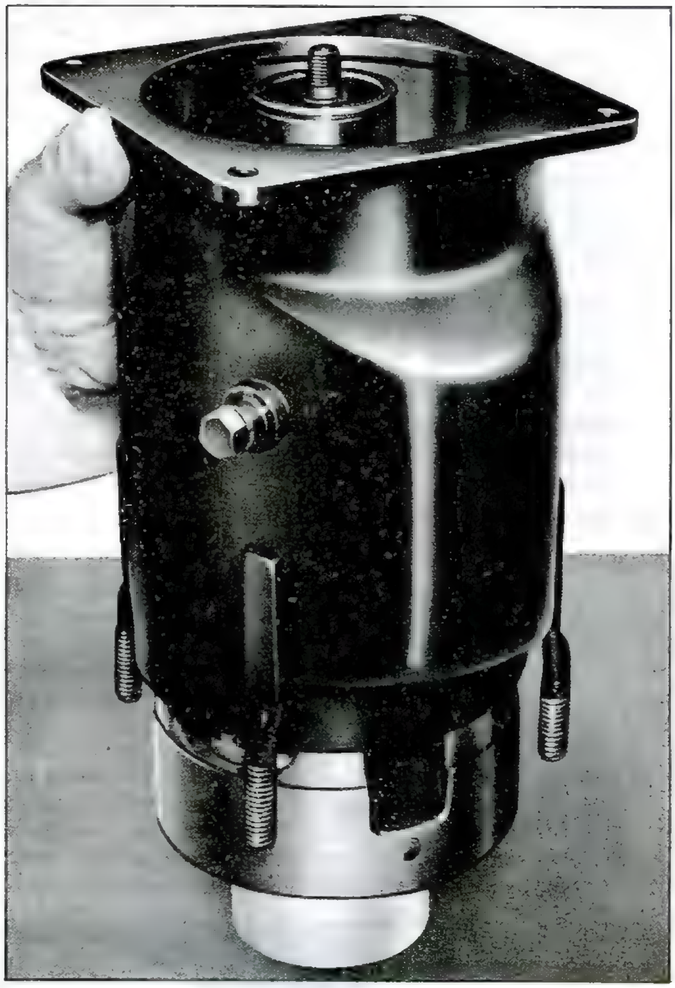


Fig. 56—Installing Shell Over Internal Mechanism

13. Assemble the dowel pins into the rear cylinder.
14. Install the discharge crossover tube rear "O" ring and spacer.
15. Replace the rear suction reed valve, rear discharge valve plate, oil pump gears, rear head and head nuts as outlined previously under "Rear Head and Reed Assemblies - Installation."

Leak Testing the Compressor

Whenever service operations are performed on the compressor shaft seal assembly or on the interior mechanism, use the following procedure to leak test the reassembled compressor.

1. Install "O" rings and Cover Plate J-9527 over the suction and discharge ports of the compressor head.
2. Hook up a refrigerant container and charging line (using Adapter J-5420) to cover plate fitting over the suction port, charge the compressor up to can pressure, and leak test compressor with a leak detector.
3. Turn off the refrigerant container valve transfer gauge line and adapter to cover plate fitting over the discharge port and repeat the procedure outlined in Step 2.

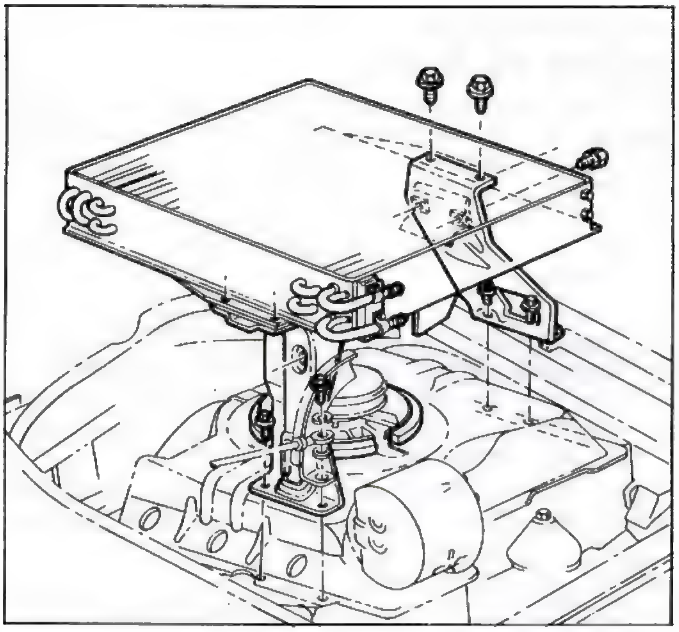


Fig. 57—Condenser Removal

4. Correct any leaks present.

COMPRESSOR BELT TENSION ADJUSTMENT

Adjust compressor belt tension to give 1/2" to 3/4" deflection under a 15 lb. load, measured midway between the compressor pulley and the crankshaft pulley.

CONDENSER

Replacement

1. Purge the system of refrigerant.
2. Remove the two refrigerant lines from the condenser and cap the lines immediately.
3. Remove the four screws on the right side, three screws on the left side of the condenser which attach the condenser and shroud assembly to the mounting brackets (fig. 57).
4. Remove the condenser assembly from the vehicle.
5. All screws attaching the shroud to the condenser core may now be removed and the core detached from the shroud.
6. Attach the shroud to the new condenser core and install the assembly onto the mounting brackets.
7. Replace the refrigerant hoses.
8. Evacuate and charge the system.

Engine Access Procedure

NOTE: It is not necessary to disconnect refrigerant lines or purge the refrigerant from the system if the condenser and shroud assembly are to be moved only enough to permit access to the engine (for fan belt replacement use the entire procedure which follows; for carburetor adjustment use only Steps 3 through 5.)

1. If engine blower belt is to be changed, loosen the compressor to bracket bolts and allow compressor to move in toward engine.
2. Remove the compressor belt.
3. Remove the screws attaching the condenser and shroud assembly to the brackets.
4. Carefully lift the assembly from the engine and rotate it toward right rear of vehicle as far as the refrigerant lines will permit.

   Leave the condenser in this position until the engine work is completed, then re-install the condenser assembly on the engine.

   CAUTION: Do not remove refrigerant lines.
5. Install screws attaching the condenser and shroud assembly to its mounting brackets.
6. Install the compressor belt and adjust belt tension.

RECEIVER-DEHYDRATOR

The receiver-dehydrator should be replaced if it has been damaged through an accident or if it leaks or becomes restricted or clogged. Do not attempt to repair the receiver-dehydrator. However, the receiver-dehydrator is merely a moisture collecting device and a refrigerant storage area and is the least likely component to cause a system malfunction.

If at any time when examining the compressor oil, moisture is found or there is an indication of moisture at the expansion valve needle, the receiver-dehydrator should be replaced as follows:

Replacement

1. Purge the system of refrigerant.
2. Remove refrigerant lines and cap the lines immediately.
3. Remove the screws attaching the receiver-dehydrator to the right quarter sheet metal.
4. Install the new receiver-dehydrator and connect the refrigerant lines.

   NOTE: Do not uncap the new receiver-dehydrator until the last instant before installation.
5. Evacuate and charge the system.

CHECKING AND ADDING OIL

In the six cylinder compressor it is not recommended that the oil be checked as a matter of course. Generally, compressor oil level should be checked only where there is evidence of a major loss of system oil such as might be caused by:

- A broken refrigerant hose.
- A severe hose fitting leak.
- A very badly leaking compressor seal.
- Collision damage to the system components.

See page 15-18 for compressor oil checking information and procedures.

COLLISION PROCEDURE

Whenever a car equipped with an air conditioning unit is involved in a collision or wreck, it should be inspected as soon as possible. The extent of damage to any or all of the component parts and the length of time the system has been exposed to the atmosphere will determine the replacement of parts and processing that will be required. The greater the length of time of exposure to the atmosphere, the greater will have been the chances for air, moisture and dirt to have entered and damaged the system. Every case may be entirely different so it is not possible to establish a hard and fast procedure to follow each time. Good judgment must be used to determine what steps should be taken in each specific case.

The following procedure is presented as a guide for use when inspecting a damaged vehicle equipped with air conditioning.

1. Remove the drive belt. Cut belt off if necessary.
2. Visually inspect the condenser, receiver-dehydrator, compressor, mounting brackets, conditioning unit, all connecting lines, and all controls to determine the extent and nature of the damage.
   a. No repairs, such as soldering, welding or brazing, should be attempted on the condenser because of its construction. If the vapor passages in the horizontal tubes or return bends or manifolds have been damaged in any way, the condenser should be replaced with a new one.
   b. The receiver-dehydrator should be replaced if there is any evidence of its having sustained either internal damage or a fracture at any of the lines or welded joints or if the system has been exposed to the atmosphere for an undetermined period of time.
   c. Examine the compressor for any visible external damage.
   d. The evaporator should be examined for damage and, if necessary removed or replaced or the entire unit processed where damaged or exposed to the atmosphere.
   e. All connecting lines and flexible hoses should be examined throughout their entire length for damage. If damaged in any manner, replace with new lines.
   f. Check all controls and connecting wires for damage and replace with new parts where needed.
   g. Check the clutch pulley for proper operation and freedom from damage.
3. Install gauge set.
4. Purge the system. Pressure should not exceed 3 to 5 pounds.
5. Remove the compressor from mounting and remove the oil test fitting.
6. Pour out the oil into a clean glass container and examine it for any foreign substance such as dirt, water, metal particles, etc. If any of these are present, the compressor and receiver-dehydrator should be replaced and the other system components should be flushed with liquid refrigerant.
7. If the oil is clean and free of any harmful substance, replace oil with Frigidaire Oil available through Parts Stock.

   NOTE: If the system components have been replaced or flushed, replace the full charge of oil. If not, add no more fresh oil than was drained in Step 6.

8. Charge up the compressor to drum or can pressure and leak test the compressor seals prior to installation of compressor. Use a special cover plate that can be fabricated as described under "Compressor Seal Replacement — Installation," Step 10.
9. Reinstall the compressor and evacuate the system by following the Evacuating Procedure.
10. Introduce R-12 vapor at cylinder (room) temperature and pressure.
11. Leak test all fittings and connections and give particular attention to a leak test at the compressor shaft seal if compressor has not been leak tested on the bench.
12. Complete system processing and charge system.

FLUSHING THE SYSTEM

To flush the components of the system with liquid refrigerant, connect the refrigerant can or drum to the unit being flushed, turn the can or drum upside down and open the can or drum valve. Remove the refrigerant lines and flush all components separately. Do not attempt to flush the entire system without first separating the components.

> **CAUTION:** As liquid R-12 enters an area of atmospheric pressure its temperature will immediately drop to -21.7°F. Be sure to direct the outlet of the unit or units being flushed into an area where the extreme cold of the escaping refrigerant will do no harm.

Dry nitrogen may also be used to flush the system components. Drum pressure should not exceed 125 psi.

FAST IDLE ADJUSTMENT

The Corvair Air Conditioning System requires an engine idle speed of 550 rpm for proper operation. With refrigeration system on and selector in drive (automatic) or gearshift in neutral (manual), adjust the idle screw until an engine speed of 550 rpm is attained (fig. 58). Also, a head pressure of 300 psi should be indicated for the refrigeration system.

> **NOTE:** If head pressure is lower than 300 psi at idle, the engine will stall when higher pressures are attained under actual operating conditions.

OPERATING INSTRUCTIONS

The Corvair air conditioner, a fresh air type, has three control levers and fan switch to provide control of cool air flow. A fourth lever controls heater temperature output. The air flow can be directed through the two front ball outlets and the center outlet bezel.

Always operate the Air Conditioning System with all windows and vents closed to eliminate drafts, wind and road noise. Cover plate furnished should remain installed over the engine air recirculating slot during the season when cooling is required. This plate should be removed and stowed on top of the rear sill for the winter (See Figure 59).

AIR CONDITIONING CONTROL PANEL

The 1965 Corvair Air Conditioning control panel makes use of four vertical acting levers and a single fan switch. Control operation is as follows:

HEAT
DEFROST—These two levers serve the same purpose as the regular production direct air heater controls. For their operation, see the heater information contained earlier in this section.

AIR —For maximum cooling capacity during periods of extreme heat and humidity, and when first turning on the system, the AIR lever should be in the full "up" position to supply full recirculated air to the system. The lever may be depressed a short distance to supply some

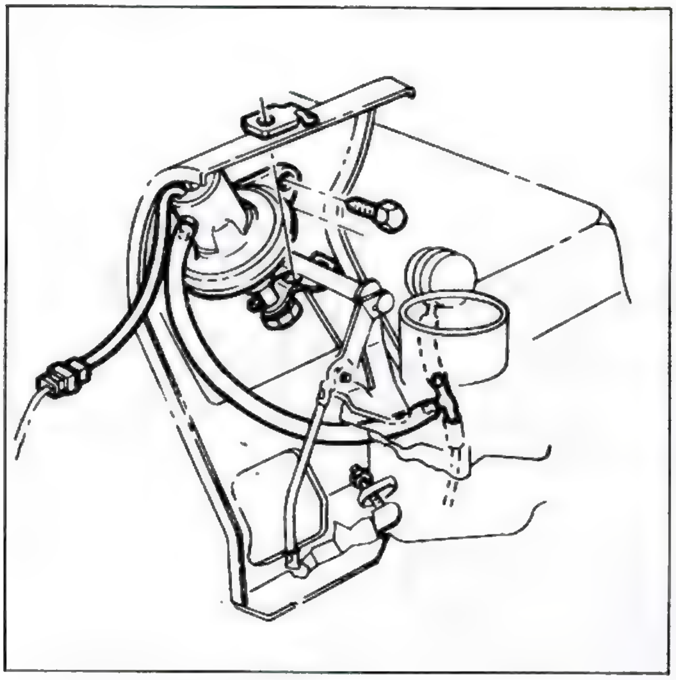


Fig. 58—Fast Idle Adjustment

outside air during less severe conditions. Under moderate heat and humidity conditions, the lever may be pushed fully down to supply 100% outside air to the system.

COOL —Depress this lever as required to provide the degree of cooling desired. The lever must be moved down off its detent position before the air conditioner blower will operate.

Fig. 59—Engine Warming Hole Cover

FAN —This switch controls either the heater or air conditioner blower, depending on the position of the COOL lever described above. During cooling operation this three speed switch must be in at least "low" position.

CAUTION: Momentary engine overheating may occur if the air conditioner is being operated during extended periods of long uphill pulls or during extreme outside temperatures. Should the "Temp-Press" light come on under such conditions, the car should be stopped and the air conditioner turned off. Check the engine fan belt for excessive looseness and the engine oil for proper level. If these items are satisfactory, start the car, then continue to drive and operate the air conditioner as long as the "Temp-Press" light remains off.

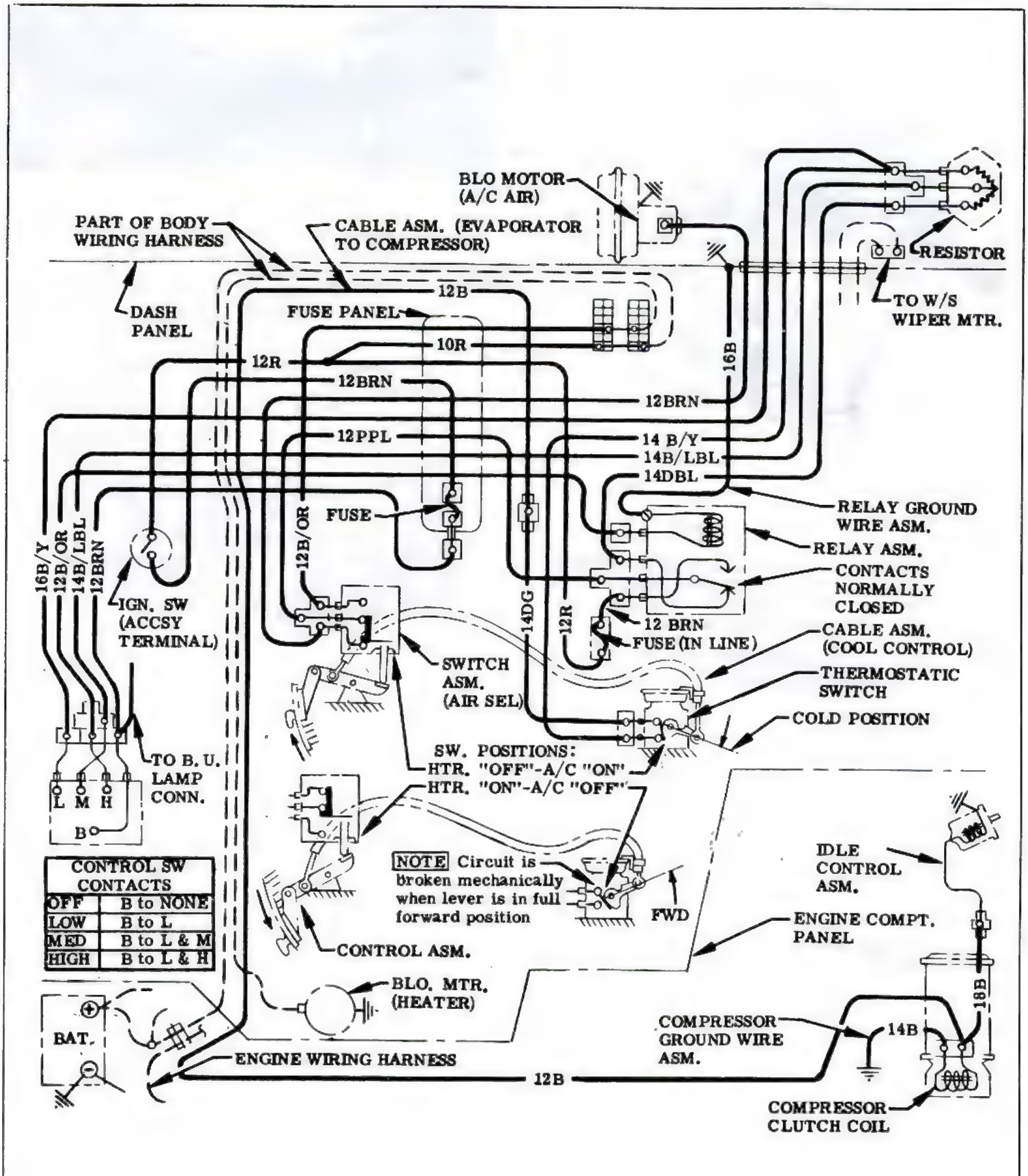


Fig. 60—Air Conditioning Wiring Diagram

SPECIAL TOOLS

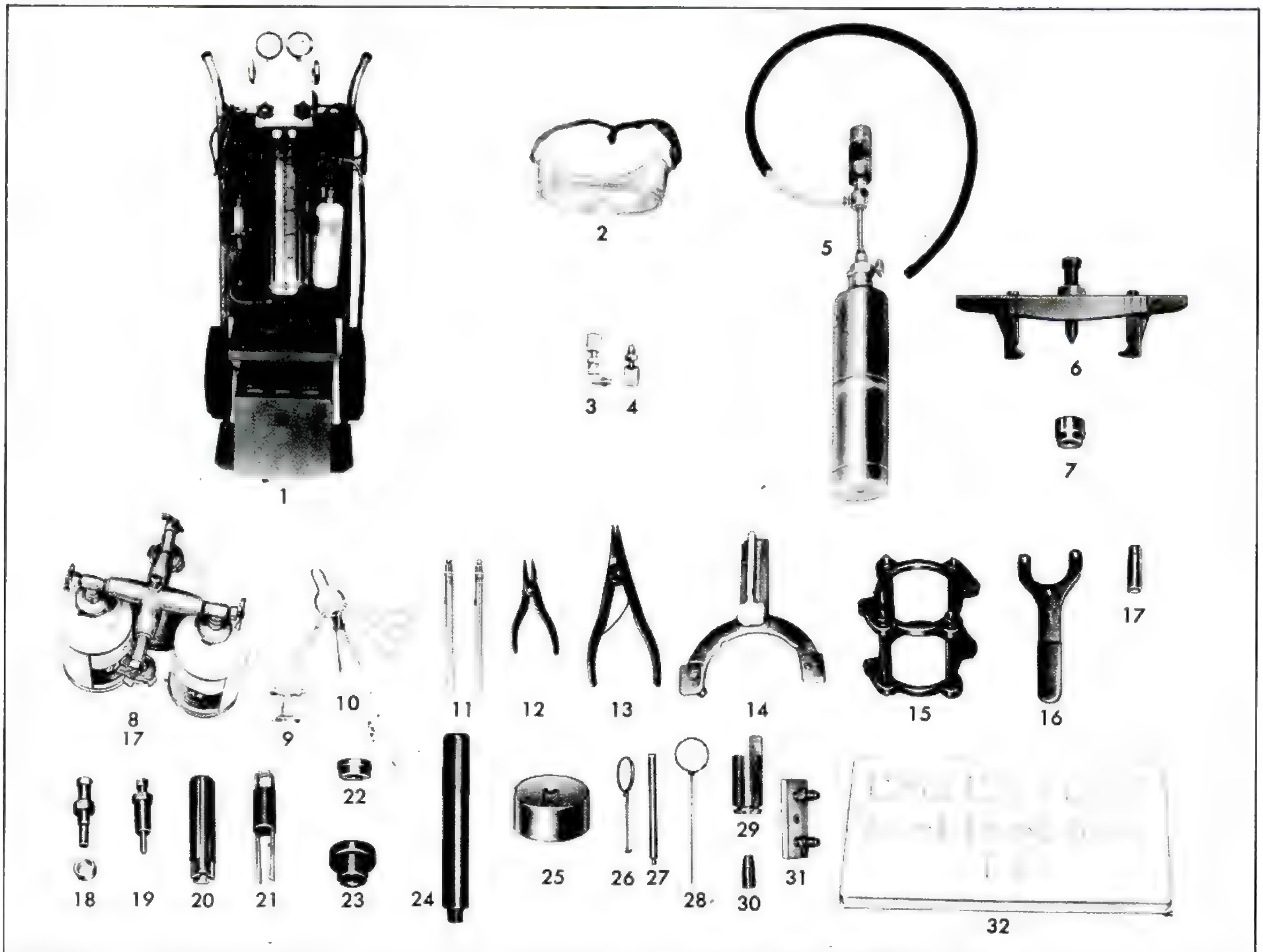


Fig. 61—Air Conditioning Special Tools

1. J-8393 Charging System
2. J-5453 Goggles
3. J-9459 90° Gauge Line Adapter
4. J-5420 Gauge Line Adapter
5. J-6084 Leak Detector
6. J-8433 Puller
7. J-9395 Puller Pilot
8. J-6272 Multi-Opener (4 Can)
9. J-6271 Fitzall Valve (Single Can)
10. J-7151 Non-Magnetic Clutch Shims
11. J-5421 Pocket Thermometers (2)
12. J-5403 #21 Snap Ring Pliers
13. J-6435 #26 Snap Ring Pliers
14. J-9396 Compressor Holding Fixture
15. J-9397 Compressing Fixture
16. J-9403 Clutch Hub Holding Tool
17. J-9399 9/16" Thin Wall Socket
18. J-9480 Hub and Drive Plate Assembly Installer
19. J-9401 Hub and Drive Plate Assembly Remover
20. J-9392 Seal Remover
21. J-9393 Seal Seat Remover
22. J-9398 Pulley Bearing Remover
23. J-9481 Pulley and Bearing Installer
24. J-8092 Handle
25. J-9521 Internal Assembly Support Block
26. J-5139 Oil Pickup Tube Remover
27. J-9432 Needle Bearing Installer
28. J-9553 Seal Seat "O" Ring Remover
29. J-21508 Seal Seat "O" Ring Installer
30. J-21303 Shaft Seal Protector
31. J-9527 Pressure Test Connector
32. J-9402 Parts Tray

SPECIFICATIONS

FRONT SUSPENSION

(SECTION 3)

Caster	Positive 2° ± 1/2°*
Camber	Positive 1° ± 1/2°*
Steering Axis Inclination	6 1/2° ± 1/2°
Toe-in (Total)	
Front	1/4" to 3/8"
Wheel Nut Torque	55 to 65 lbs. ft.
Wheel Bearing Endplay	.001" to .008"

*Within 1/2° of opposite side.

Riding Height:

MODEL	DIMENSION "A" (See page 3-9)
All Models	26.2" ± 1/2"**

**Measurements between sides should be within 1/2" of each other.

REAR AXLE AND SUSPENSION

(SECTION 4)

REAR AXLE

Type	Differential integral with engine and transmission, driving rear wheels independently through universal joints.
Lubricant Capacity (Pints)	4 1/2
Type Recommended	SAE 80, Multi-Purpose, meeting requirements of U.S. Ordnance Spec. MIL-L-2105B
Ratio (to 1)	3.27, 3.55
Gear Backlash	.003-.010" (.005-.008" desired)

Pinion Bearing Preload (in. lbs.) New	5-10
Pinion Adjustment	Shim
Differential Bearing Adjustment	Sleeves
Bolt Torques	
Ring Gear	40-60 ft. lbs.
Drive Spindle Flange	100-150 ft. lbs.
Drive Spindle Yoke Nut	100 ft. lbs.
Pinion Adjusting Sleeve Lock	20-25 ft. lbs.
Differential Cover	130-230 in. lbs.
Differential Carrier to Transmission	35-50 ft. lbs.

REAR SUSPENSION

Type	Stamped steel torque control arms with adjustable brackets for toe-in setting. Rubber mounted front and rear lateral strut rods with eccentric cam bolt at rear strut rod outer pivot for camber adjustment.
Shock Absorbers	
Make	Delco
Type	Direct, double-acting; hydraulic
Toe-in (Total) Rear	1/8" to 3/8"
Camber (Rear)	Neg. 1° to 0

Bolt Torques	
Rear Wheel Spindle Support to Torque Control Arm	25-35 ft. lbs.
Torque Control Arm Bracket to Underbody	20-30 ft. lbs.
Front Strut Rod Outer Nuts	11-15 ft. lbs.
Front Strut Rod Bracket to Transmission Support	20-30 ft. lbs.
Torque Arm Bushing Pivot Nut	90-130 ft. lbs.
Rear Strut Rod Pivot Nut	75-90 ft. lbs.
Rear Strut Rod Bracket to Differential Carrier	20-30 ft. lbs.
Rear Shock Absorber Lower Attaching Nut	35-55 ft. lbs.
Rear Shock Absorber Upper Nut	75-100 in. lbs.

BRAKES

(SECTION 5)

Main Cylinder Diameter
- Organic . . . . 1.0"

Wheel Cylinder Diameter
- Front . . . . .875"
- Rear . . . . .9375"

Brake Lining (Bonded)
- Width
  - Front . . . . 2.5"
  - Rear . . . . 2.0"

Thickness
- Primary . . . . .17"
- Secondary . . . . .20"
- Minimum Serviceable . . . . .030"

Length (Front and Rear)
- Primary . . . . 9.01"
- Secondary . . . . 9.75"

ENGINE

(SECTION 6)

ENGINE MECHANICAL

ENGINE			Base	Hi-Perf.	4 x 1	Turbo-Charged
GENERAL DATA:						
Horsepower @ rpm			95 @ 3600	110 @ 4400	140 @ 5200	180 @ 4000
Torque @ rpm			154 @ 2400	160 @ 2800	160 @ 3600	265 @ 3200
Type			Flat Opposed			
Number of Cylinders			6			
Bore			3-7/16"			
Stroke			2-15/16"			
No. System (Rear to Front)	Left Bank		2-4-6			
	Right Bank		1-3-5			
Firing Order			1-4-5-2-3-6			
Compression Ratio			8.25:1	9:1	9:1	8:1
CYLINDER BORE:						
Out of Round (max.)			.002"			
Taper (max.)			.005"			
Diameter (base)			3.4370"			
PISTONS:						
Clearance Limits to Cylinder	Top Land		.022"-.031"			
	Skirt		.0011"-.0017"			
Ring Groove Depth	Compression		.1785"-.1865"			
	Oil		.1717"-.1750"			
PISTON RINGS:						
Compression	Width		.064"-.065"			
	Clearance in Groove		.0017"-.004"			
	Gap		.013"-.025"			
Oil Ring	Width		.126"± .0005"			
	Clearance in Groove		.0012"-.005"			
	Gap		.015"-.055"			
PISTON PINS:						
Length			2.630"-2.650"			
Diameter			.7999"-.8002"			
Clearance	In Piston	New	.00015"-.00025"			
		Wear Limit	.001"			
	In Rod		Press Fit			

CONT'D.

ENGINE			Base	Hi-Perf.	4 x 1	Turbo-Charged
CONNECTING RODS:						
Bearing	Clearance	New	.0007"-.0027"			
		Max.	.003"			
	End Play	New	.005"-.010"			
CRANKSHAFT:						
End Play			.002"-.006"			
End Thrust Taken By			(#1) Rear Main Bearing			
Main Bearing Journal	Diameter		#1 & 2 (2.0978"-2.0988")			
			#3 & 4 (2.0983"-2.0993")			
	Clearance		#1 & 2 (.0012"-.0027")			
			#3 & 4 (.0007"-.0022")			
	L. Runout (max.)		.001"			
	Taper (max.)		.001"			
Crankpin Journal	Diameter		1.799"-1.800"			
	Taper		.001"			
	Runout		.001"			
CAMSHAFT:						
Lobe Lift Measured at Push Rod	Intake		.257"	.260"		
	Exhaust		.257"	.260"		
Journal Diameter	Front		1.440"			
	All Others		1.200"			
Journal Runout (max.)			.0015"			
VALVE SYSTEMS:						
Lifters Type			Hydraulic			
Rocker Arm Ratio			1.5:1			
Valve Lash Intake & Exhaust			1 Turn down from "NO LASH"			
Intake	Face Angle		45°			
	Seat Runout (max.)		.002"			
	Seat Angle		45°			
	Recommended Seat Width		1/32"-1/16"			
	Stem to Guide Clearance		New .001"-.0027" Used .001"-.004"			
	Lift at Valve Stem		.385"	.390"		
Exhaust	Face Angle		44°			45°
	Seat Runout (max.)		.002"			
	Seat Angle		45°			
	Recommended Seat Width		1/16"-3/32"			
	Stem to Guide Clearance		New .0014"-.0029" Used .002"-.005"			
	Lift at Valve Stem		.385"	.390"		
Valve Springs	Outer Spring Press. and Length	Free Length	2.08"			
		Pressure lb. @ in.	78 to 86 @ 1.660"			
		Pressure lb. @ in.	170 to 180 @ 1.260"			
	Inner Spring Damper	Size	.045" x .250"			
		Type	Flat Wound			
		No. Coils	Approx. 4			
	Installed Height		1-21/32" ± 1/32"			

ENGINE COMPONENT TORQUES

Size	Usage	Torque
1/4-20	Oil Pan	85-105 in. lbs.
	Oil Pump Cover	60-80 in. lbs.
	Oil Cooler to Cylinder Head	40-60 in. lbs.
	Shroud Attachment	60-80 in. lbs.
	Valve Rocker Cover	40-60 in. lbs.
	Oil Suction Screen Pipe Clamp	30-50 in. lbs.
5/16-18	Crankcase L.H. to R.H. (One in Oil Sump)	7-13 ft. lbs.
	Crankcase Cover	7-13 ft. lbs.
	Oil Cooler Adapter to Crankcase	7-13 ft. lbs.
	Oil Filter and Delcotron Adapter	7-13 ft. lbs.
	Rear Housing	7-13 ft. lbs.
	Clutch Cover and Pressure Plate	15-20 ft. lbs.
11/32-24	Flywheel (Syn. Transmission)	40-50 ft. lbs.
	Flex Plate (P/G Transmission)	20-30 ft. lbs.
3/8-16	Oil Cooler to Adapter	8-12 ft. lbs.
	Shroud Attachment	10-20 ft. lbs.
	Skid Plate	15-20 ft. lbs.
	Flywheel or Clutch Housing	20-30 ft. lbs.
	Crankshaft Pulley to Balancer	25-35 ft. lbs.
7/16-20	Crankcase L.H. to R.H.	50-55 ft. lbs.
	Oil Filter	15-20 ft. lbs.
1/2-20	Crankshaft Pulley or Balancer	40-50 ft. lbs.
5/16-24	Connecting Rod	20-26 ft. lbs.
3/8-16	Exhaust Manifold Clamp	22-27 ft. lbs.
	Rear Mounting Bracket	40-50 ft. lbs.
3/8-16	Stud - Cylinder Head to Crankcase	10-30 ft. lbs.
	Switch - Cylinder Head Temperature	10-15 ft. lbs.
3/8-24	Cylinder Head Nut	32-38 ft. lbs.
	Valve Rocker Arm Stud	32-38 ft. lbs.
	Adjusting Nut - Valve Rocker Arm	55-125 in. lbs.
	Distributor Clamp Nut	8-12 ft. lbs.
	Sending Unit - Cylinder Head Temperature	5-10 ft. lbs.
	Switch Cylinder Head Temperature	10-15 ft. lbs.
1/2-20	Oil Pan Drain Plug	30-35 ft. lbs.
1/8-27	Oil Pressure Switch	45-65 in. lbs.
9/16-18	Oil Pressure Regulator Valve Plug	10-20 ft. lbs.
14 mm.	Spark Plug	15-20 ft. lbs.

ENGINE MOUNT TORQUES

Attaching Part	Torque
Front Mount Nuts	60-80 ft. lb.
Bracket-to-Transmission	20-30 ft. lb.
Front Mount-to-Crossmember	20-30 ft. lb.
Rear Mount Nuts	50-60 ft. lb.
Rear Mount-to-Frame	14-22 ft. lb.

CARBURETORS

(SECTION 6M)

APPLICATION	CARBURETOR
95 H.P. Engine Syn. or P/G	7025023*
110 H.P. Engine Syn.	7025023*
110 H.P. Engine P/G	7025024*
140 H.P. Engine Primary	7025023
140 H.P. Engine Secondary	7025226
All With Air Conditioning	7025025
180 H.P. Engine Turbocharged	3856713

*Not Used with Air Conditioning

<table>
<tr><th rowspan="2">Carburetor</th><th colspan="3">Rochester HV</th><th>Rochester H</th><th>Carter YH</th></tr>
<tr><th>7025023</th><th>7025024</th><th>7025025</th><th>7025026</th><th>3856713</th></tr>
<tr><td>Float Level</td><td colspan="4">1-1/16"</td><td>5/8"</td></tr>
<tr><td>Float Drop</td><td colspan="4">1-1/2"</td><td>2-3/8"</td></tr>
<tr><td>Pump Rod</td><td colspan="4">Index Line</td><td></td></tr>
<tr><td>Choke</td><td colspan="3">2 Turns Up from Free Entry to Lever</td><td></td><td>Index</td></tr>
<tr><td>Unloader</td><td colspan="3">.312"</td><td></td><td>7/16"</td></tr>
<tr><td>Fast Idle</td><td colspan="3">.078"</td><td></td><td></td></tr>
<tr><td>Vacuum Break</td><td colspan="3">.180"-.195"</td><td></td><td></td></tr>
<tr><td>Main Jet</td><td>.051"</td><td>.050"</td><td>.051"</td><td>.050"</td><td>.098"</td></tr>
<tr><td>Idle Tube</td><td colspan="3">.024"</td><td></td><td>.031"</td></tr>
<tr><td>Bowl Vents</td><td>2 Internal</td><td colspan="2">1 External Idle</td><td>2 Internal</td><td>1 Internal</td></tr>
<tr><td>Metering Rods</td><td colspan="4"></td><td>.057"
.048"</td></tr>
<tr><td>Pump Discharge Jets</td><td colspan="4">Two @ .022"</td><td>One @ .028"</td></tr>
<tr><td>Throttle Bore</td><td colspan="4">1-1/4"</td><td>1-1/2"</td></tr>
<tr><td>Main Venturi</td><td colspan="4">1"</td><td>1-3/8"</td></tr>
</table>

ENGINE ELECTRICAL

(SECTION 6Y)

BATTERY	1980007
Ground	Neg
Plates	54
Ampere Hour	44

GENERATOR	**1100639**	**1100698**
Application	Base	Optional
Cold Output amps	35	45
Cold Output Volts	14	14
Field Current Draw @ 12 V. 80°F	2.2-2.6	2.8-3.2

VOLTAGE REGULATOR	**1119515**
Application	All*
Voltage Regulator	
Air Gap	.067
Setting @ 85°F	13.8-14.8
Point Opening	.014
Field Relay	
Air Gap	.015
Point Opening	.030
Closing Voltage	1.5-3.2

STARTING MOTOR	**1108306**	**1108307**
Application	Std. Trans.	Auto. Trans.
Brush Spring Tension (oz.)	35	35
Free Speed		
Volts	10.6	10.6
Amperes	58	58
rpm	6750-10,500	6750-10,500
Resistance Test		
(Armature Locked)		
Volts	4.0	4.0
Amperes	280	280
Torque-Mounting Pad Bolts (ft.-lbs.)	20-30	20-30
Solenoid		
Hold-in Windings	10.5-12.5 Amperes @ 10V	
Both Windings	42-49 Amperes @ 10V	

IGNITION COIL	
Application	All
Primary Resistance, ohms	1.28-1.42
Secondary Resistance, ohms	7200-9500

IGNITION RESISTOR	
Type	Special Wire—Part of Harness
Resistance	1.8 ohms

SPARK PLUGS	**AC-44FF**	**AC-46FF**
Application	110, 140 and 180 hp	95 hp
Size	14 mm.	14 mm.
Plug Gap	.030"	.035"
Torque	15-20 lb. ft.	

*External Field Discharge Diode Circuit with Generator 1100698.

DISTRIBUTOR	1110310	1110311	1110319	1110329	1110330
Application	95 HP Std. Trans.	95 HP Powerglide	110 HP (All)	180 HP Turbo-Charged	140 HP 4 x 1 BBL
Rotation-View from Drive End	CCW	CCW	CCW	CCW	CCW
Breaker Point Gap . . .	.019" New—.016" Used				
Breaker Arm Tension . .	19-23 oz. (Measured just behind points)				
Condenser Capacity . . .	.18-23 Micro Farads				
Firing Order	1-4-5-2-3-6				
Ignition Timing @ Idle . .	6° BTDC	14° BTDC	14° BTDC	24° BTDC	18° BTC
Cam Angle (Dwell)	31°-34°				
Centrifugal Advance Start	0° @ 700 rpm	0 @ 1700 rpm	0° @ 800 rpm	0° @ 4000 rpm	0° @ 800 rpm
Intermediate	4° @ 1200 rpm				
Maximum	28° @ 4200 rpm	24° @ 4200 rpm	20° @ 4800 rpm	18° @ 4900 rpm	18° @ 2800 rpm
Vacuum Advance Start	0° @ 6" Hg	0° @ 7" Hg	0° @ 7" Hg	0° @ 2 psi*	0° @ 6" Hg
Full Advance (+Engine).	24° @ 14" Hg	24° @ 15" Hg	24° @ 15" Hg	12° @ 4.5 psi*	22° @ 14" Hg

*Retard

CLUTCH

(SECTION 7)

ENGINE	Name		Turbo-Air 164		Turbocharged 164
	Horsepower		95	110	150
	Displacement, cu. inches		164		
TRANSMISSION			3-Speed 4-Speed		
CLUTCH ASSEMBLY					
Type			Single Dry Disc, Centrifugal		
Clutch Cover and Pressure Plate Assembly	Effective Plate Load, lb.		1250-1450		1275-1475
	Type of Drive		Steel Straps		
	Pressure Plate	Material	Cast Iron		Nodular or Perlitic Malleable Iron
		OD	9.28		
	Clutch Spring	Type	Diaphragm, Bent Finger Design		
		Material	HR Spring Steel		
	Ring Gear	Material	HR Steel		
		No. of Teeth	147		
		Face Width	.363-.387		
		PD	12.25		
		Attachment	Welded to Clutch Cover		
	Attachment to Flywheel		6 Bolts, 5/16-18, .82 Long; Bolt Circle Dia. 10.625		
Drive Plate Assembly	Type		Single Disc with Two Friction Surfaces		
	Cushions		Flat Spring Steel between Rings		
	Friction Ring	Material	Woven Asbestos		
		OD	8.00		9.12
		ID	6.00		6.12
		Total Area (sq. inches)	44.00		71.8
		Width (ea.)	.135		
Flywheel	Material		Cast Iron		
	OD		11.6		
Bearings	Release	Type	Single Row Ball		
		Lubrication	Packed with Temperature High Viscosity Grease		
	Pilot	Type	Sintered Powdered Bronze Bushing		
		Lubrication	Oil Impregnated		
Controls	Clutch Fork		Drop Forged Steel, Pivot Mounted on Ball		
	Pedal Mounting		Pendent, from Brace on Dash		
Clutch Housing	Material		Aluminum Alloy		
	Attachment to Engine		9 Bolts, 3/8-16 UNC 2A: 7 Short, 1-3/8 Shank; 2 Long, 1-5/8 Shank		

TRANSMISSIONS

(SECTION 7)

MANUAL TRANSMISSIONS

GENERAL DATA

Make . . . . . . Chevrolet synchromesh, manual shift
Type 3-Speed, 4-Speed
Location . . . . In rear compartment-integral with engine and differential.
Transmission Case Material . . . . Cast aluminum alloy

GEAR SHIFT

Control . . . . Remote
Type . . . . Lever
Location . . . . Floor mounted

GEARS

Type . . . . Helical
Material . . . . Forged steel, hardened

	3-SPEED	4-SPEED
Synchronization	2nd and 3rd	1st, 2nd, 3rd, 4th
Constant Mesh Gears	2nd and 3rd	1st, 2nd, 3rd, 4th
Sliding Gears	1st and reverse	Reverse

10,100, 10,500, 10,700 SERIES

RATIOS	3-Speed	4-Speed
First	3.22:1	3.20:1
Second	1.84:1	2.19:1
Third	1.00:1	1.44:1
Fourth		1.00:1
Reverse	3.22:1	3.66:1

LUBRICANT

Type Recommended . . . . Multipurpose Gear Lubricant SAE 80.
Capacity (pt.) 2.2 3.6

AUTOMATIC TRANSMISSIONS

GENERAL DATA

Make and Type . . . . Chevrolet, hydraulic torque converter with automatic planetary gear system for reverse and low.
Transmission Case Material . . . . Cast aluminum alloy
Converter Maximum Torque Ratio (at stall) 2.6:1
Total Transmission Torque Multiplication (converter planetary gear ratio)
  Maximum overall transmission ratio 4.73:1
  Low gear drive or low range . . . 4.73:1 to 1.82:1
  Reverse range . . . . 4.73:1 to 1.82:1
Oil Type . . . . "A", suffix "A"
Oil Capacity (pt.)
  Dry . . . . Approx. 13
  Refill . . . . Approx. 6
Oil Cooled By . . . . Air
Selector Lever
  Location . . . . At right of steering column on instrument panel.
  Operation . . . . Actuates manual valve in hydraulic control system.
  Positions (indicated on quadrant on instrument panel). Four (bottom to top)—L-Low, D-Drive, N-Neutral, R-Reverse.

HYDRAULIC TORQUE CONVERTER

Type . . . . Three element
Driving Member (pump) . . . . Sheet metal, multi-vane type, spot welded to torque converter housing. Housing cover is bolted to flywheel.
Driven Member (turbine) . . . . Sheet metal, multi-vane type, supported by torque converter housing cover. Turns independently of housing. Splined to input shaft.
Reaction Member (stator) . . . . . . Aluminum air foil type supported on stationary sleeve by an over-running clutch of cam and roller design.

CLUTCHES

Type . . . . Multiple disc
High
  Discs, Driving
    Number and type . . . . . Two, non-metallic faced
  Discs, Driven
    Number and type . . . . Three, steel
Reverse
  Discs, Driving
    Number and type . . . Three, non-metallic faced
  Discs, Driven
    Number and type . . . . Three, steel plates and one cast iron pressure plate.

PLANETARY GEAR UNIT

Type . . . . Compound planetary
Gear Ratios
  Cruising range . . . . 1:1 (direct drive)
  Low range 1.82:1
  Reverse 1.82:1
  Low brake band . . . . Double-wrap design
  Low band servo
    Type . . . . Piston, one release spring

HYDRAULIC CONTROLS

Manual Valve
  Type . . . . Spool
Pressure Regulator Valve
  Type . . . . Spool
Governor
  Type . . . . Centrifugal
  Drive . . . . From transmission output shaft

STEERING
(SECTION 9)

STEERING GEAR

Type	Recirculating Ball
Steering Ratio	
Gear	18:1
Overall	23.5:1

LINKAGE

Type	Parallel Relay
Location	Front of Wheels
Tie Rods	2

TORQUE CHART

Worm Bearing Preload	3-1/2 to 4-1/2 in. lbs.
Sector Lash Adjustment	8 to 10 in. lbs. in excess of above
Max. Steering Gear Preload	14 in. lbs.
Steering Gear Mounting Bolts	25-35 ft. lbs.
Pitman Shaft Nut	80-105 ft. lbs.
Steering Wheel Nut	25-35 ft. lbs.
Tie Rod End Nut	29-43 ft. lbs.
Tie Rod Clamp Bolts	12-16 ft. lbs.
Idler Arm Mounting Bolts	14-20 ft. lbs.

CHASSIS ELECTRICAL
(SECTION 12)

Bulb Application	Candle Power	Number
Headlamp Unit—Outer: High Beam	37-1/2 Watt	4002
Low Beam	55 Watt	Sealed Beam
Inner: High Beam	37-1/2 Watt	4001
Parking Lamp, Tail, Stop and Directional Lamps	4-32	1157
Back-up Lamps	32	1156
Instrument Lamps	3	1816
Directional Signal Indicator, Headlamp High Beam Indicator and Heater Control Panel Lamps	1	1445
Temperature-Pressure (Oil) Indicator, Generator-Fan Indicator, Glove Compartment Lamps	2	1895
Dome Lamp (Cartridge Type)	12	211
Courtesy Lamp	6	631
License Plate Lamp	4	67
Radio Dial Lamp	2	1893

FUSES AND CIRCUIT BREAKER

A 15 ampere circuit breaker in the light control switch protects the headlamp circuit, thus eliminating one fuse.

Fuses located in the junction block beneath the dash are:

- Heater Blower
  Glove Compartment Lamp—3AG/AGC-10 amp
- Tail and Stop Lamps, Dome Lamp
  Cigarette Lighter—3AG/AGC-10 amp
- Heater (Total)
  Back-Up Lamp—3AG/AGC-20 amp
- Radio—3AG/AGC—2.5 amp
- Instrument Panel Lamp
  Radio Panel Lamp
  Heater Control Panel Lamp—3AG/AGC-3 amp
- Windshield Wiper—3AG/AGC-20 amp

Air Conditioner Fuses . . . . 3AG/AGC—15 amp. (Located in 14 GA and 12 GA gray wires in area of ignition switch.)

WIPER MOTOR

Single Speed

Type	Electric
Crank Arm Rotation (looking at the crank arm)	CCW
Crank Arm Speed (No Load)	43 rpm
Operating Voltage	12 VDC
Current Draw (Free Speed)	3.0 amp Max.
(Dry Windshield)	3.5 amp Max.
Stall Current	11 amp

Two Speed

Operating Volts . . . . 12 VDC
Gear Ratio 36:1
Crank Arm Rotation (looking at Crank Arm). . . CCW
Crank Arm Speed (rpm's) (No Load):
Lo . . . . 34 Min.
Hi . . . . 65 Min.
Current Draw: amps
No Load (Lo Speed) 3.6
Installed in Car—(Dry Glass) 4.5
Stall 12
Shunt Field Resistance 24

WASHER PUMP

Number of "squirts" at full pressure 12
Pressure (psi) 11-15
Coil Resistance (ohms) 20

WIRING CIRCUIT COLOR CODE

DIAGRAM KEY	WIRE COLOR
B	Black
B/LG	Black with Light Green Stripe
B/LBL	Black with Light Blue Stripe
B/P	Black with Pink Stripe
B/OR	Black with Orange Stripe
B/W	Black with White Stripe
B/Y	Black with Yellow Stripe
BRN	Brown
DBL	Dark Blue
DG	Dark Green
PPL	Purple
R	Red
T	Tan
GY	Gray
W/OR/P	White with Orange and Pink Stripes

ACCESSORIES

(SECTION 15)

AIR CONDITIONING

Compressor

Make . . . . Frigidaire
Type . . . . 6 Cylinder AXIAL
Displacement . . . . 10.8 Cu. In.
Rotation . . . . Counter-Clockwise

Blower Motor

Volts 14
Amps (Cold) . . . . 9.4 (Max.)
RPM (Cold) 3100

Compressor Clutch Coil

Ohms (at 80°F) 3.85
Amps (at 80°F) . . . . 3.2 @ 12 Volts

System Capacities

Refrigerant R-12
Compressor Oil . . . . Frigidaire 525 Viscosity
R-12 . . . . 5 lbs.
Compressor Oil . . . . 10 oz.

Fuse . . . . 2 fuses: 1 in-line and 1 in fuse block (both 15 amp).

PROMPT DEPENDABLE QUALITY

SUPER

CHEVROLET

SERVICE